604-CD-003-002

EOSDIS Core System Project

ECS Operations Concept for the ECS Project: Part 2A - ECS Release A

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November 1995

Hughes Information Technology Corporation
Upper Marlboro, Maryland

ECS Operations Concept for the ECS Project: Part 2A - ECS Release A

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SUBMITTED BY

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

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Abstract

This is Part 2A of the ECS Operations Concept Document (OCD). The ECS OCD consists of a Part 1 which is a release independent ECS Overview and several Part 2's which are release specific. This volume - Part 2A- provides the operational concepts for ECS Release A.

This document provides an overview of the missions supported by Release A, a set of activity descriptions for the operational processes performed by ECS, operational scenarios to further describe and illustrate the activities, and a description of ECS activities at each site. This document provides final documentation of the concept for Release A operational activities discussed at the June 1995 Operations Concept Workshop. **The material contained in Section 4 - Section 6 was extracted from the workshop presentations and supplemented with introductory and descriptive text to provide clarity and organization. The material was updated as a result of the operations workshop issues (addressed at operations teleconferences), where applicable. Some workshop issues are addressed in Release B, where others were questions only. In addition, two new scenarios were added to the Part 2A OCD: Trouble Ticketing / Problem Tracking and Request From Hell. The Order Tracking Scenario was updated to reflect End-to-End Order Tracking. The Release A format of Section 4 - Section 6 is primarily in viewgraph form, as per agreement with Greg Hunolt. These scenarios will be converted to the Release B format upon final issue of Part 2B of the ECS OCD.**

Keywords: assimilation, DAO, migration, COTS, intermittent, CPU, degradation, ingest, ancillary, anomaly, SSI&T, methodology, reprocessing

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Change Information Page

List of Effective Pages	
Page Number	**Issue**
Title iii through xiv 1-1 and 1-2 2-1 and 2-2 3-1 through 3-10 4-1 through 4-268 5-1 through 5-64 6-1 through 6-40 AB-1 through AB-5	

Document History			
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Contents

4. Release A Operational Activities

5. Site Overviews

6. System Level Scenarios

Figures

Tables

Abbreviations and Acronyms

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1. Introduction

1.1 Identification

This document is Part 2A of the ECS Operations Concept Document (OCD). It is submitted as required by Data Item Description (DID) 604/OP1 for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) Contract (NAS5-60000).

1.2 Scope

This OCD Part 2A document describes the Operations Concept for Release A of ECS. The OCD Part 2s are Release and site specific for each Release and are separately identified as OCD Part 2A for Release A, OCD Part 2B for Release B, and so forth.

This document (OCD Part 2A) is based on the Technical Baseline for the ECS Project, 210-TP-001-002, dated December 1994. It is anticipated that GSFC's contractual compliance documentation will be revised to be consistent with the Technical Baseline.

This document provides the operations concept for the science data processing and system operations management activities of ECS Release A. These activities are performed at the DAACs and SMC.

1.3 Purpose and Objectives

This OCD - Part 2A establishes the ECS Release A mission support, describes the ECS operations processes, provides overviews of the activities at each Release A ECS site (including a Day in the Life scenario), and describes system level, i.e., cross site, scenarios. The OCD Part 2A provides guidance to system engineers during the system design phase to ensure that the system architecture and design will accommodate the operational concepts and the system users'/providers' needs. Additionally, the OCD Part 2s:

- provide a configurable basis for details in other Project documents that contain scenarios, such as test and acceptance plans and procedures, and in the Operations Scenarios Document (605/OP2).
- provide guidance for the establishment of staffing plans.
- define operational roles.
- help to define the performance of the individual system elements and the performance between those functional elements.
- provide the basis for development of operations plans and procedures

1.4 Status and Schedule

The original version of the ECS Operations Concept Document was submitted to Goddard Space Flight Center (GSFC) one month prior to the System Requirements Review (SRR) as a Configuration Control Board (CCB) approval code 1 document. An updated version was submitted as a post - SDR (System Design Review) revision in August of 1994.

In March 1995 the baseline version of the OCD Part 2A Annotated Outline was submitted as a result of a number of comments from the user community and an agreement with GSFC to reformat the document into a system level Part 1 and Release specific Part 2s. A Configuration Change Request (CCR) was initiated to formally change the OCD's format to consist of the multiple Parts described earlier in this section. The OCD Part 1 was approved by the CCB in June of 1995.

1.5 Document Organization

The contents of this document are organized as follows:

Section 1	Introduction - Introduces the ECS OCD scope, purpose, objectives, status, schedule, and document organization. Clarifies the purpose and scope of the OCD Part 1 versus the Release-specific OCD Part 2s.
Section 2	Related Documentation - Provides a bibliography of reference documents for the OCD Part 1 organized by parent document, reference document, and information document subsections.
Section 3	Release Overview - Describes the missions supported by Release A and the Release A operations sites.
Section 4	Release A "Key" System Operations Activities - provides descriptions of the key activities of ECS science data processing and system operations management. The activities as described here are site independent, i.e., they describe the way an activity will be performed without site or dataset specifics.
Section 5	Site Overviews - describes the activities performed at each site during ECS Release A, including the following subsections: site interfaces, site mission activities, and Day in the Life of the Site. The frequency at which the activities are performed at a site are provided.
Section 6	System Level Scenarios - provides specific examples of how individual ECS activities discussed above in Section 4 combine to provide the infrastructure needed for ingest, production and archiving (“push”); information discovery and retrieval (“pull”); and overall system management.

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content derive:

423-41-01	Goddard Space Flight Center, EOSDIS Core System Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System
423-10-01-0	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements, Volume 0
423-10-01-01	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements, Volume 1

2.2 Applicable Documents

The following documents are referenced within this OCD or are directly applicable, or contain policies or other directive matters that are binding upon the content of this volume.

209-CD-007-002	Interface Control Document Between EOSDIS Core System and TRMM Science Data and Information System (TSDIS)
209-CD-008-002	Interface Control Document Between EOSDIS Core System and the Goddard Space Flight Center Distributed Active Archive Center
209-CD-009-002	Interface Control Document Between EOSDIS Core System and the Marshall Space Flight Center Distributed Active Archive Center
210-TP-001-004	Technical Baseline for the ECS Project
222-TP-003-008	Release Plan Content Description for the ECS Project
420-TP-003-001	SDPS End to End Scenarios Overview for the ECS Project
none	Goddard Space Flight Center, Draft EOSDIS Science Operations Concept, Draft
none	Goddard Space Flight Center, Earth Observing System Mission Operations Concept Document

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

194-00313TPW	ECS User Characterization Methodology and Results
420-WP-003-001	Mission Statement for TRMM Release for the ECS Project

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3. Release Overview

This section of the document describes the missions supported by Release A. This section is complementary with section 5 in which the operational concept for ECS's support of the missions is given on a DAAC by DAAC basis.

Section 3 contains the following subsections:

3.1. Release A Mission Statement:

3.2. Missions Supported by ECS Release A

3.3. Version 0 Data Migration

3.4. ECS Sites for Release A

3.5. Description of ECS Support for Missions

3.1 Release A Mission Statement:

The mission of Release A is to provide an end-to-end system that supports the TRMM spacecraft (See Figure 3-1). The data from each EOS instrument will be sent to the Distributed Active Archive Center (DAAC) responsible for processing, archiving, and distributing EOS and related data. These data centers will house the ECS computing facilities and operational staff needed to produce EOS Standard Products and to manage, store, and distribute EOSDIS data, as well as the associated metadata and browse data, that allow effective use of the data holdings. The DAACs will exchange data via dedicated EOSDIS networks to support processing at one DAAC which requires data from another DAAC.

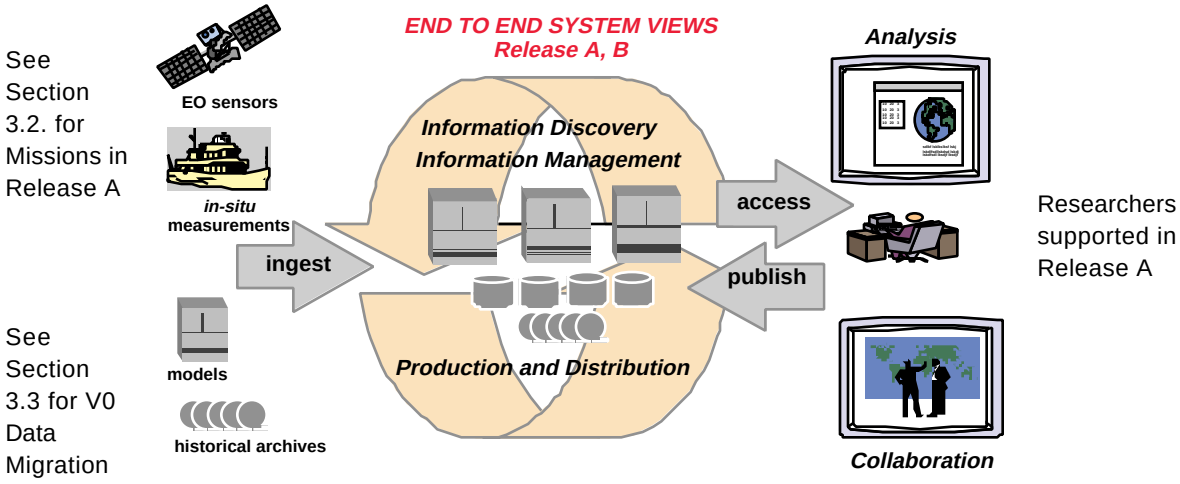


Figure 3-1. ECS End-to-End System Views

End-to-end EOSDIS services depend on ECS providing a robust infrastructure with some components having high reliability, high throughput or large storage capacity. Certain mission critical components must be highly reliable to support launches and to ensure that data are not lost. Examples of mission critical components include maintenance of reliable, long-term data archives for global change research. Loss of long-term data would seriously impair the EOS mission. Other ECS components, i.e. the EOS data processing components, provide high throughput in order to ingest, process, and archive the high data rates from the TRMM spacecraft. Capturing the raw TRMM spacecraft data and processing it to the level required to confirm data validity are mission critical functions. However, downstream processing of higher level products is important but not mission critical since recovery from processing errors or loss of data products can be accomplished by reprocessing from lower level input data.

Open access to EOS and other Earth science data by all members of the science community, about 16000, distinguishes EOS from previous research satellite projects, where selected investigators had proprietary data rights for a number of years after data acquisition. This open data policy will lead to greater utilization of EOS data products, for global change research and other applications. The EOS program is also distinguished by the large number of NASA funded investigators (over 500), who provide expertise across the broad range of scientific disciplines in Earth system science.

The ECS Release A system will be deployed December 1996 at four of the Distributed Active Archive Centers (DAACs) - GSFC, EDC, MSFC, and LaRC. It will be the first operational release of the ECS capability for all but EDC which will employ the system for interface testing. Release A has the primary objectives of (1) comprehensive data processing of the TRMM data for CERES and LIS instruments (at LaRC and MSFC respectively) through L4 product generation and distribution, receipt, archive and distribution of TRMM data products received from TSDIS; (2) full ground operations support for TRMM including regridding of ancillary data, algorithm ingest, execution and test support, data access and associated client and data management services; (3) V0 data migration; (4) early interface testing support for Landsat-7; and (5) early interface testing support for EOS AM-1.

Releases B, C and D will support future EOS missions, such as EOS AM-1 and EOS PM-1, and will incorporate evolutionary changes such as new processing and storage technologies. Successive releases will provide expanded and increasingly enhanced data search and access, based on feedback from the science community.

3.2 Missions Supported by ECS Release A

The missions supported by the Release A of ECS are shown in Table 3-1. ECS support varies by mission. Details of the ECS support for the missions is given in Section 3.5.

Table 3-1. Mission Baseline

Mission	Instruments	Launch Date
TRMM	CERES, LIS, VIRS, PR, TMI	17 August, 1997 Initially Supported by ECS Release A

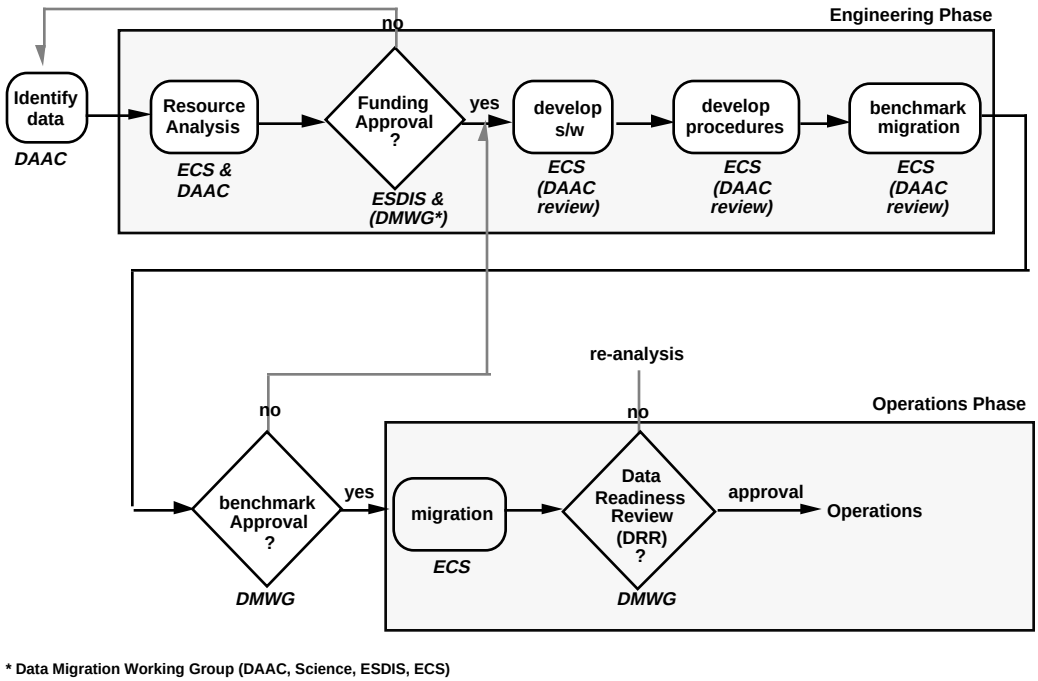
In addition to the support of the flight missions listed in Table 3-1, ECS supports early interface testing for Landsat-7 and EOS AM-1.

3.3 Version 0 Data Migration

Because of the value of past remote sensing data to Global Change Research, NASA has elected to migrate Version 0 data to ECS as part of the overall Version 0-to-Version 1 transition. ECS is being designed for a long life cycle (at least two decades beyond the launch of the first EOS spacecraft) with architectural features that facilitate technology upgrades and evolution. Migration to ECS will ensure continued maintenance of these important historical Earth science data. After migration, ECS will provide information management and data archive and distribution functions for past NASA Earth science flight missions and other Earth science data held by NASA. Users will gain access to improved services, new functions, and better performance. Version 0-to-Version 1 migration is being planned from a users' point of view to ensure continuous data availability throughout the migration process.

The methodology used for migrating data is presented in Figure 3-2. The migration will be supported by an ad hoc Migration Working Group (MWG) for each data set to be migrated. The MWG consists of DAAC management, DAAC science, ESDIS, and ECS personnel. The data migration process is documented in the Data Migration Plans (DMP). The DMPs are working documents that live throughout the migration of each data set.

The engineering phase of data migration includes the analysis of the data, developing of any software and/or procedures, and the migrating of samples of the data (benchmark) to prove the process. The data will migrate to a current level of service or higher. This means that some data may migrate with a bit-for-bit migration, some may just have new metadata generated, and some may be converted into the Version 1 high level of service.



* Data Migration Working Group (DAAC, Science, ESDIS, ECS)

Figure 3-2. Methodology for Migrating Version 0 Data.

The operations phase accomplishes the physical migration of the data from V0 to V1. At the end of the migration of a data set (data, metadata, browse, documentation, etc.) a Data Readiness Review (DRR) will be held with DAAC management and ESDIS personnel to verify the operational readiness of the data set. Until the DRR, data will be available operationally from the V0 system. Transition of the operational responsibility from V0 to ECS will be made transparent to the user community. Data will always be available to the science community through two way interoperability between ECS and V0.

The approach in Figure 3-2 allows the migration of smaller amounts of data before the eventual migration of large volumes of V0 data. The growth path is shown in Table 3-2. A parallel activity to the pilot migration project is the development of a cost model for data migration. Each step in the process will help in refining the cost model. This approach will allow broad review of the migration process, provide ECS with needed test data, and provide ESDIS (and DAACs) with a realistic cost model estimates throughout the migration process.

Table 3-2. Incremental Growth Path for V0 Migration

Migration step	# data sets	notes
Pilot Migration	at least 1 data product per DAAC	- sample granules; not operational
Release A Data Sets	3 data sets per Release A DAAC	- operational migration at start of Release A
High Priority Data Sets	about 180 data sets	- operational migration during Release A and Release B
Remaining V0 Data Sets	about 435 data sets	- operational migration completed by end of Release B

At the end of the migration of a V0 data product (data, metadata, browse, documentation, etc.) a Data Readiness Review (DRR) will be held with DAAC management and ESDIS personnel to verify the operational readiness of the data product. Until the DRR, the data product will only be available from the V0 system. Access to V0 data utilizing the Release A client is possible, however, since Release A will employ the V0 client in accomplishing browse, search and order functions.

Users employing the V0 client will be able to access Release A data holdings via a " V0 gateway". In this way, a gradual transition of V0 to ECS services will be provided to the user; however, not a turnkey switch from one to the other. Full two-way interoperability between the V0 and ECS data is provided in this manner.

3.4 ECS Sites for Release A

This document is based on the ECS Change Order 1 list of locations and Statement of Work. ECS operations occur at the institutions shown below:

- Distributed Active Archive Centers (DAACs):
  - Goddard Space Flight Center (GSFC) — Greenbelt, Maryland
  - Langley Research Center (LaRC) — Hampton, Virginia
  - Marshall Space Flight Center (MSFC) — Huntsville, Alabama
- System Monitoring and Coordination Center/EOS Science Network (SMC) — GSFC Building 32, Greenbelt, Maryland

3.5 Description of ECS Support for Missions

This section provides descriptions of each mission and the a description of flows between each DAAC and EOC for each of the following missions:

3.5.1. TRMM Mission Support

3.5.2. ECS AM-1 Mission Support

3.5.3. Landsat 7 Mission Support

3.5.4. Data Assimilation Office (DAO) Support

3.5.1 TRMM Mission Support

The TRMM is a Mission to Planet Earth mission designed to advance our understanding of total rainfall and to determine the rate of rainfall and the total rainfall occurring over the tropics and subtropics (between +35 and -35 degrees latitude). TRMM is also designed to facilitate the measurement and analysis of the Earth's radiant energy budget and lightning. The mission is a joint venture between National Aeronautics and Space Administration (NASA) and the National Space Development Agency of Japan (NASDA).

The TRMM Science Data and Information System (TSDIS) and ECS work together to provide support for the Visible and Infrared Scanner (VIRS), TRMM Microwave Imager (TMI), Precipitation Radar (PR) instruments to be flown on the TRMM observatory, and corresponding Ground Validation (GV) data. The ECS interface includes the Marshall Space Flight Center (MSFC) and Goddard Space Flight Center (GSFC) Distributed Active Archive Centers (DAACs). This support includes science data archive and distribution. A brief description of the TRMM mission and TSDIS-ECS interfaces follows. See Figure 3-3 for an overview of ECS support of the TRMM mission.

TSDIS, located at GSFC, will house a TRMM Science Data Operations Center (SDOC) and a Science Operations Control Center (SOCC). The TSDIS will process PR, TMI, VIRS, and GV data and generate various levels of standard data products. The TSDIS-generated science data products will be made available to the TSDIS Science Users (TSUs) (algorithm developers, instrument scientists, and quality control scientists) through Remote Science Terminals (RSTs). In addition, the standard TRMM data products will be transferred from the TSDIS to the ECS for archive, TSDIS access for reprocessing, and distribution to the research user communities.

The MSFC DAAC supports research in the discipline areas of passive microwave remote sensing of the atmosphere, atmospheric electricity and lightning detection, and global hydrologic and atmospheric modeling. The MSFC DAAC will have responsibility for archive and distribution of the TMI, PR, combined PR/TMI (archive location is TBR by TSDIS/ESDIS), GV data, and ancillary data.

The GSFC DAAC supports research in the discipline areas of the upper atmosphere, atmospheric dynamics, global biosphere, and geophysics. The GSFC DAAC will have responsibility for archive and distribution of data products for the VIRS instrument, ancillary data, and products generated using VIRS and other data products (TBR).

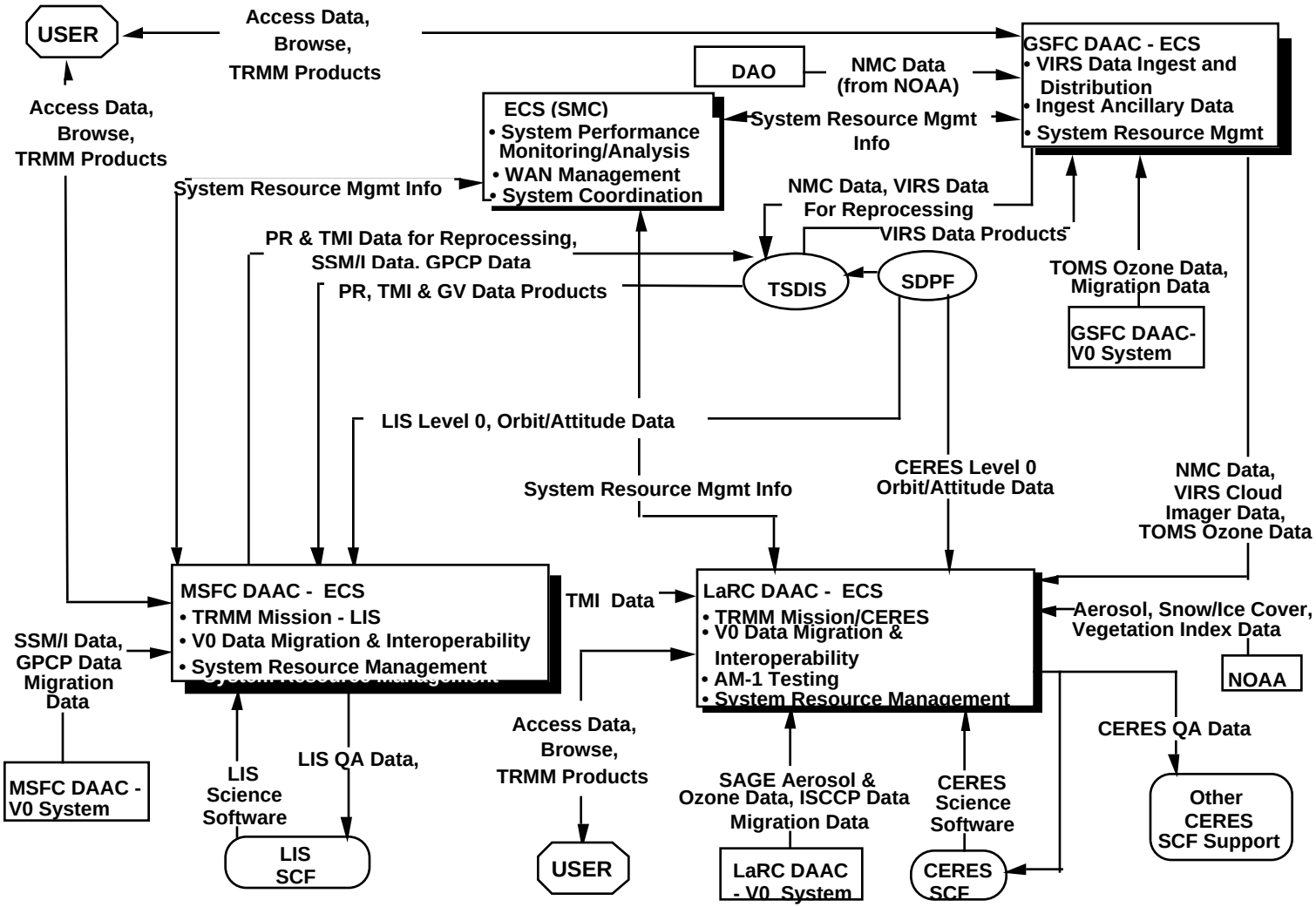


Figure 3-3 ECS Support of TRMM Mission

3.5.2 ECS AM-1 Mission Support

Release A provides the capability for supporting AM-1 ingest interface testing. The AM-1 payload complement consists of five instruments: Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), Clouds and Earth's Radiant Energy System (CERES), Multi-angle Imaging SpectroRadiometer (MISR), Moderate Resolution Imaging SpectroRadiometer (MODIS), and Measurements Of Pollution In The Troposphere (MOPITT). Facility Instrument operations are coordinated by Team Leads (TLs). The Facility Instruments on AM-1 are ASTER and MODIS. CERES, MISR and MOPITT operations are coordinated by their principal investigators (PIs). See Figure 3-4 for an overview of ECS Release B support of the AM-1 mission operations.

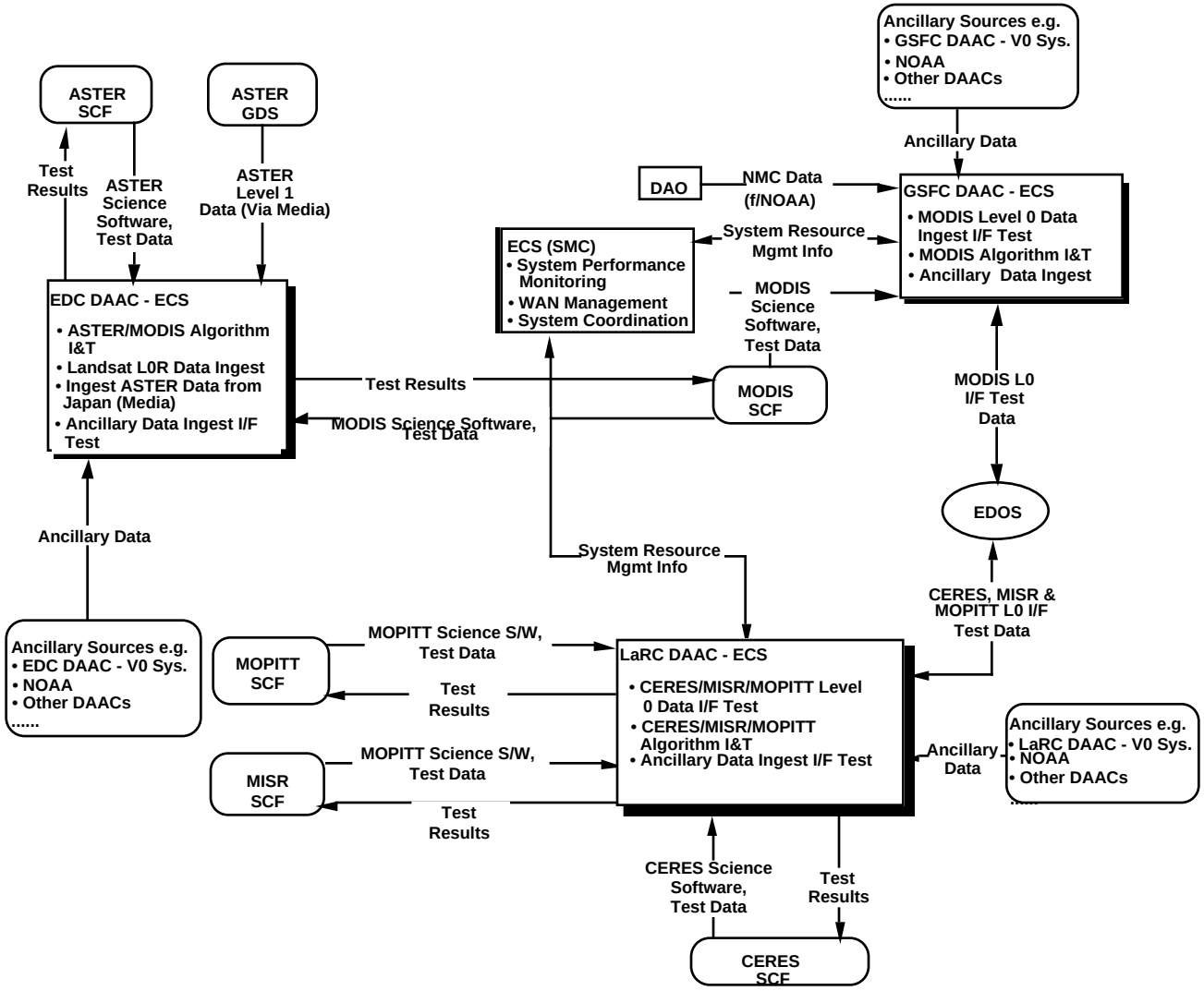


Figure 3-4 ECS Support of AM-1 Mission

3.5.3 Landsat 7 Mission Support

Release A provides capabilities for supporting Landsat-7 ingest interface testing. The Landsat -7 Program will provide a satellite remote sensing capability serving a broad community of users, including those involved in global change research as well as civil, national security, academic, and commercial applications. The Landsat -7 Program will continue the remote sensing capability currently provided by Landsats 4 and 5.

The Landsat- 7 System development will be managed by the Earth Science Mission Office (ESMO) Project of the NASA GSFC. The ESMO Project is part of the EOS Program. Another project in the EOS Program is the ESDIS Project. Included in the development of EOSDIS will be Distributed Active Archive Centers (DAACs) throughout the United States to receive, process, archive, and distribute EOS data. An EOSDIS DAAC will be at the USGS's EROS Data Center (EDC). The ESMO Project will utilize the functionality planned for EOSDIS to the maximum extent practical to provide commonalty between Landsat -7 and the other "Mission to Planet Earth" projects.

3.5.4 Data Assimilation Office (DAO) Support

Release A supports the testing of the ECS interface with the DAO. The Data Assimilation Office (DAO), located at GSFC and part of the GSFC DAAC (TBR), is responsible for developing advanced assimilation algorithms used to produce research-quality assimilated data products, e.g., multi-year gridded global atmospheric datasets, for the Earth Observing System (EOS). Data from the National Oceanic and Atmospheric Administration (NOAA) and other sources are provided to the Data Assimilation System (DAS) [at the DAO] in an operational mode. Some of the DAO-acquired NOAA (i.e., NMC) datasets are required by ECS as ancillary data for ECS production (e.g., CERES). In addition, ECS supplies the TRMM Science Data Information System (TSDIS) with ancillary data, including the NMC data, for TSDIS production. The ECS and the DAO work in coordination with one another so as to supply ECS with NMC ancillary data required for TRMM and ECS product generation. The ancillary products to be delivered are agreed upon by ECS and the DAO well in advance of the ECS need date.

4. Release A Operational Activities

This section provides final documentation of the concept for Release A operational activities discussed at the June 1995 Operations Concept Workshop. Some of the material contained in Section 4 - Section 6 was extracted from the workshop presentations, updated as a result of workshop discussions and supplemented with introductory and descriptive text to provide clarity and organization.

The Release A System Operations Management activities described in this section are:

4.1 Computer System Administration

4.2 Fault Management

4.3 Configuration Management

4.4 Performance Management

4.5 Security and Accountability Management

4.6 Resource Planning

4.7 Resource Management and Control

The Release A Science Operations activities described in this section are:

4.8 Science Data Ingest

4.9 Science Data Archival

4.10 Science Data Distribution

4.11 Production Planning

4.12 Production Processing

4.13 User Services

4.14 Science Software Integration and Test

4.1 Computer System Administration Activities

Site ECS computer system hardware and software activities that must be performed by the Computer System Administrator are categorized as administrative and operational activities. Those activities and the tools used by the administrators are identified.

See SYS ADMIN 1a through 1g.

4.1.1 Computer System Administration Backup Scenario

The scenarios that describe many of the activities associated with the system administrator are included in other sections of this document. The one activity that does not overlap with the other

scenarios is the backup scenario. The following charts describe a backup scenario that would be performed by the system administrator.

The general assumption with the backup scenario is that the system will have incremental backups that are run daily, complete backups that are run monthly and that the backup jobs are all run at midnight. The frequency and times that these jobs are run are policy driven and can be different for each DAAC. Also another assumption is that each backup job will contain a QA report for easy analysis.

The system administrator schedules/plans the backup jobs with the resource manager and production manager. These jobs are then run unattended nightly with the complete backup being run once a month.

The system administrator would review the QA report each morning by using the provided word processor to display the text file. If a problem were to occur to the complete backup that is scheduled monthly for example , the administrator may want to reschedule that job as soon as possible. Other problems may require changes in the procedure, for example the time that the job is run. After the jobs have been QAed, the backup is logged in an electronic file using the word processor. This file then could be examined by anyone who wanted information concerning the status of backups or information concerning any problems associated with the backups.

Monthly, the system administrator would invoke the Report Generation GUI to generate reports detailing the backups. The information contained in these reports would include information that would help in future planing of the size and scope of the backup activity.

See SYS ADMIN 2a through 2c.

4.2 Fault Management Activities

Fault management addresses the detection and notification of faults associated with the following:

- Network devices
- Hosts and peripherals
- Operating Systems
- Process monitoring

See FAULT MGMT 1a through 1f.

Following are scenarios of specific operational system faults. They include a text description, an event trace diagramming the process and operators involved, and a table identifying system and operator actions and data exchanged.

4.2.1 Intermittent CPU Failure Scenario

NOTE: This scenario (and the following one) are scenarios that were proposed as desirably complex ones to be dealt with. As such, the titles shown here are the ones originally proposed, and have been retained for easy recognition. The title for this particular scenario may be misleading

since the fault that we are dealing with is a total CPU failure, not “Intermittent” as the title suggests.

The assumption made for this scenario is that there is a maintenance contract established with the vendor of the Symmetric Multiprocessing (SMP) host in question (the primary/critical production system) to respond for corrective maintenance in no more than four hours of a call being placed.

In setting up for fault detection, the Management Agent on the main production CPU (SMP) is configured to detect various categories of faults, including hardware errors (CPU, Memory, peripherals), by monitoring the console device and system log files. One of the CPUs in an SMP (Symmetric Multiprocessing) host (the primary/critical production system) has a hardware error, which is logged to the console and the system log by the operating system. The Management Agent detects the error and sends an alert to the Fault Management Application which provides a notification to the Resource Manager (RM) via an audible alert and by changing the color of the icon corresponding to the host. Further, an error message is logged and displayed in the event browser window with diagnostic information on the error. A Trouble Ticket is opened by the RM, who logs the system Id, time of occurrence (for RMA (MDT, MTTR, MTBF) purposes), and assigns it to the Hardware Maintenance Technician (HMT). The RM is then able to isolate the nature of the fault by browsing through the event browser window, and by browsing through the logfile, is able to determine that there have been no other related hardware errors logged. The RM updates the TT with the time, his/her initials and findings, and assigns the TT to the HMT. The HMT calls the vendor, describes the nature of the fault, and logs a service call. The vendor confirms that a spare CPU board for the SMP host is in the inventory.

The RM apprises the Operations Supervisor of the situation. Since the host supports Production, the Production Planner and Monitor (PPM) are also informed of the situation, who then, with the RM approve one hour down time for the CPU swap. The PPM suspend all new production jobs, and determine the host can not be brought down now since a rerun would take 12 hours, and that the three jobs currently running would likely complete in four hours, based on the fact that one CPU is not available

The assumption at this point is that it is determined that recovery of the production backlog is possible even with the delay; therefore the jobs are not rescheduled.

The HMT updates the Trouble Ticket with the scheduled down time (i.e., to indicate the “wait” time so as to allow MDT to be accurately computed). The vendor is informed of the schedule to shutdown, who then arrives at the appointed time with the replacement CPU board. The production jobs 20 minutes more than expected after which the system is shut down, the CPU board replaced, diagnostics run, and the system rebooted within an hour from the originally scheduled time. The total down time for the host is 30 minutes. The HMT updates the Trouble Ticket to enter information for down time, and changes the status of the Trouble Ticket to “Closed”. The Production Monitor then resumes the production tasks held in the production queue for this host. Based on the information in the Trouble Ticket, the accurate calculation of MDT of the host, the MTBF and the MTTR the CPU board, by the Performance Management Application facilitated.

See FAULT MGMT 2a through 2e.

4.2.2 User Notes Performance Degradation Scenario

This scenario deals with a user experiencing performance degradation problems several times in using a service at a DAAC while logged in from his SCF. The scenario shows how with the use of the Trouble Ticketing capabilities, problem resolution histories are maintained for ready reference, and how the resolution process is expedited.

A user calls User Services (US) to report bad response time of the system. The US person opens a Trouble Ticket (TT), enters information about the user (Name, location, telephone number, email address, and a description of the problem - particularly the transaction that had the response time), which in this case happened to be a Search in the Advertising Service. The US person gives the user a reference TT number.

While still on the phone, the user notices an improvement in response time, and tells the US so. The US person changes the status of the TT to "Fixed", adds a description, and assigns it to the Performance Analyst (PA). The US person also tells the user to call again with the reference number in case the problem reoccurs.

The PA begins an investigation of the reported problem. The performance data examined does not reveal any performance bottlenecks, which is consistent with the lack of alerts due to degradation of performance. The PA then updates the TT with a description of the findings, closes it, and the notifies the user of the findings via email.

The problem reoccurs on a different day, the user sends an incident report electronically, and then calls US with the old TT reference number. The (new) US person is able to retrieve the original problem description and the result of the original investigation. A new TT is opened, updated with a description of the problem and a reference to the previous TT, and assigned again to the PA. The user if informed of the new reference number. As in the first instance, performance improves during the conversation, and the user informs the US person. The TT is updated and assigned the status "Fixed", but is not closed.

The PA investigates the issue again, come up with the same results as before, and it is suggested to the user that the problem may be at the user's end, and that the user's Systems Administrator (SA) be contacted to look into the problem. The user's SA looks at performance data for the user's host, finds CPU utilization normal, and indicates that there is no performance problem on the user's side.

The problem occurs a third time, and the user calls the US with the old TT reference numbers. A new TT is opened and assigned to the PA as before, who then contacts the user's SA. The analysis of the data at the user's network for the three time intervals that the user has reported problems indicates that while network and the user's host show normal utilizations, the highest level of activity on the LAN was between the user's host and the local archive server. It is found that this traffic was due to data being transferred during a test run of an algorithm being developed by the user. The local SA then loads a more granular performance management product on the user's host, and with the user, recreates the scenario, while collecting performance data. This reveals that the network adapter on the user's host is the performance bottleneck (low bandwidth), "choking" when the data transfer for the algorithm occurred. This was found to coincide with the time the

user tried to access the Advertising Service. The SA then informs the user and the personnel at the DAAC, based on which, the TT at the DAAC is updated with the analysis & resolution and closed.

See FAULT MGMT 3a through 3e.

4.3 Configuration Management (CM) Activities

Discussion is provided regarding the Release A configuration management (CM) process and responsibilities, with references to documents that provide more detail such as the Configuration Management Plan for the ECS Project (194-102-MG1-001). The scope of the operations CM concept is limited to control of ESDIS approved ECS hardware and software resources introduced to the operational environment for Release A.

See CONFIG MGMT 1a through 1g.

Following in the sections below are operations scenarios describing specific CM applications and processes. Each scenario contains a process diagram, table of system-operator actions and descriptive text.

4.3.1 COTS Hardware Problem Scenario

See CONFIG MGMT 2a and 2b.

This scenario is presented to distinguish between a hardware problem that does not involve a configuration management issue and later scenarios that do.

In this scenario an operator at the DAAC, EOC, or SMC experiences a problem with his/her workstation (i.e. it crashes). The operator reports the problem either to the system administrator (SA) or by recording the problem into the Trouble Ticketing System (TTS[1]). Assume the operator reports the problem directly to the SA. The SA diagnoses the problem as a system board failure and logs it into the TTS. The maintenance engineer receives the trouble ticket, uses the Baseline Manager to identify the workstation configuration and the responsible maintenance vendor, and calls the maintenance vendor.

The vendor's maintenance technician arrives and confirms that the system board has failed; replaces the board with an identical board (i.e. same make, model, version); brings the system back up and verifies that the system is operational; and reports the board replacement to the ECS maintenance technician. The site Maintenance Engineer records the time the vendor arrived and departed and actions taken to resolve the problem into the TTS, closes the trouble ticket, and records the serial number of the new board into the property management system.

This scenario did not involve a change to the baselined configuration, therefore no Configuration Change Request (CCR[1]) was generated and no Configuration Control Board (CCB) action was required. Had the repair action resulted in the installation of a part of a different make, model, and/or version from that originally in the workstation, a CCR would have been generated, as presented in the "HW Emergency Change Scenario."

4.3.2 Hardware Emergency Change Scenario

See CONFIG MGMT 3a and 3b.

This scenario involves the failure of hardware that requires emergency replacement of a component that is of a later version than is contained in the original equipment in order to bring a system back into operation.

This scenario is at 7PM on a Saturday evening. The operator has detected a problem with the automated tape library (ATL) and reported the problem to the Trouble Ticketing System (TTS). The trouble ticket is routed to the System Administrator, who confirms that the system will not operate and notifies the site Maintenance Engineer. After running further diagnostics, the Maintenance Engineer reports the problem and symptoms to the OEM's maintenance desk. The OEM maintenance representative arrives and concludes that a controller card has failed. The only card the OEM has immediately available is of a later version and no spares are available on site. It will be Monday at the earliest before a replacement board of the same revision level can be located. The site maintenance engineer reports this to the operations Crew Chief (i.e. shift leader) for a decision.

The DAAC cannot afford to have the ATL down until Monday. The Crew Chief calls the DAAC manager at home, apprises him of the situation, and obtains approval to replace the board with the later version if tests conclude that it works properly. The OEM's maintenance representative installs the board. The site's Sustaining Engineers tests the new controller board, find that it works properly, and bring the ATL back on line. The Sustaining Engineer generates a CCR to document the configuration change and the authority for the change. The site Maintenance Engineer records the replacement action in the TTS, references the related CCR, and closes the trouble ticket. The site Maintenance Engineer updates the property record with the model, version, and serial number of the new board.

The site CM Administrator reviews the CCR, determines whether it requires review by the site CCB, and updates the Baseline Manager with the new configuration and CCR # authorizing the

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[1]Trouble Tickets are used to record problems reported by the science community, ECS operations personnel, or developers. They may also be used to record an enhancement idea for consideration by the Sustaining Engineering organizations at the DAACs or at the ECS SEO. Trouble tickets remain such until it has been determined that a configuration change is required to solve a problem or to develop an enhancement. Once a configuration change is required, a Configuration Change Request (CCR) is prepared. The CCR is used to document, assess impacts of, provide recommendations for, and approve proposed changes the ECS configuration items (CIs) or configuration controlled items (i.e. components of CIs). Trouble tickets only result in the generation of a CCR when a configuration change is proposed. CCRs do not have to be preceded by a Trouble Ticket but must be prepared when a configuration change is being considered for approval and implementation.

change. The CCR is also reviewed by the ECS SEO to assess whether there may be impacts to the ECS and/or applicability to other sites. The ESDIS CCB is provided an information copy of the CCR for their review and concurrence.

In the event that it is later discovered that the new version controller board has adverse impacts when operating in the ECS configuration, a board of the original version will have to be obtained to replace the newer version. In such case, the action will be recorded on a new CCR, referencing the previous CCR.

4.3.3 COTS Software Problem Scenario

See CONFIG MGMT 4a and 4b.

This scenario involves a problem with COTS SW that is maintained by commercial SW developer (i.e. IDL Corporation).

A user reports a problem with the IDL visualization SW to the site's User Services Desk. The User Services Desk records the information and opens a Trouble Ticket in the TTS. (NOTE: If an ECS operator notices the problem, he/she reports the problem by opening the Trouble Ticket). The Trouble Ticket is routed to the site Sustaining Engineer(s) for diagnosis. The Sustaining Engineer verifies that the visualization SW creates a error code each time a series of commands is executed, and reports it to the commercial SW developer's Help Line. The developer has had previous reports of the problem from other customers and has developed a patch to resolve it. The Sustaining Engineer is told that the patch is available on the Internet, who then retrieves the patch. (NOTE: The site Sustaining Engineer has the option, since this SW is used at all sites, to forward the Trouble Ticket to the ECS SEO for resolution. In this case, he has taken the problem on at the site level.)

The site Sustaining Engineer tests the patch and verifies that it solves the problem and does not conflict with other ECS applications. The Sustaining Engineer prepares a CCR using Change Request Manager, recommending that the patch be approved for installation at the site. The CCR is forwarded by the site's CM Administrator to the Site CCB and to the ECS SEO. The SEO retrieves the patch, conducts further testing, and concludes that the problem affects all sites. The SEO forwards the CCR to the other sites for their comments, recommending that the ESDIS CCB approve the patch for installation at all sites. The ESDIS CCB reviews the DAAC assessments in making its decision. The ESDIS CCB may direct that the patch be installed at all sites, selected sites, not at all, or leave it to the option of the individual DAACs. The CCB may also establish a schedule in which the installations must be accomplished or leave it up to the DAACs to determine the schedule.

When approved by the ESDIS CCB, the patch is provided to all sites, tested by the site Sustaining Engineer (optional), and installed by the site's System Administrator. Any site having an open Trouble Ticket associated with the patch will close its Trouble Ticket once the patch is installed. The site System Administrator reports installation of the patch to the site's CM Administrator, who updates the Baseline Manager and records completion of the CCB-directed installation in the Change Request Manager. Once all sites report installation of the patch, the ECS System Administrator closes the CCR and reports closure in the next status report to the ESDIS CCB.

4.3.4 Custom Software Problem Scenario

See CONFIG MGMT 5a and 5b.

This scenario involves a problem (not an enhancement) with custom SW developed by the ECS Science and Communications Development Organization (SCDO) and maintained by the SEO.

A science user reports a problem with one of the ECS toolkits to the site's User Services Desk. The User Services Desk records the information and opens a Trouble Ticket in the TTS. (If an ECS operator notices the problem, he/she reports the problem by opening the Trouble Ticket.) The Trouble Ticket is routed to the site Sustaining Engineer(s) for diagnosis. The Sustaining Engineer verifies that the toolkit's interface to another ECS application (either custom or COTS) does not provide the desired results and identifies the source statements that are in error. The Sustaining Engineer estimates that it will take one man month to correct and test the application and generates a CCR recommending that the ECS SEO perform the work. The site CCB reviews the CCR and concurs that it be forwarded to the SEO for resolution. (NOTE: The site CCB has the option to develop the fix at the site with its Sustaining Engineering staff or to forward the CCR to the ECS SEO for resolution, since the SW is used at all sites). If the site Sustaining Engineer develop the fix, the ESDIS CCB would still have to approve installation of the fix at the site and determine whether and when it should be installed at all sites.

The ECS CM Administrator receives the CCR and forwards it to the SEO for assessment and recommendation. Using ClearCase (the SW CM System), the SEO, confirms the problem, solution, and resources required to do the work. It determines that the problem is serious enough to fix now, rather than incorporate into a future release, and recommends to the SEO develop the SW change and implement across all DAACs. (NOTE: The SEO and SCDO could decide that the change should be developed by SCDO, rather than the SEO, because of the nature of the change, affect on development work, or work loads). The DAACs review the CCR and provide their impact assessments and recommendations to the ESDIS CCB. The ESDIS CCB directs that the change be developed by the SEO and installed at all DAACs on a specified date, during a specific window, or by a specific date.

The SEO develops, compiles, tests, and distributes the new SW version according to the CCB-directed schedule. The new version is entered into ClearCase. The site's Sustaining Engineer tests (optional) and the Systems Administrator installs the change. Sites having an open Trouble Ticket associated with the fix close their Trouble Ticket once the patch is installed. The site System Administrator reports installation of the new version to the site's CM Administrator, who updates the Baseline Manager and records completion of the installation in the Change Request Manager. Once all sites report installation of the patch, the ECS System Administrator closes the CCR and reports closure in the next status report to the ESDIS CCB.

4.3.5 COTS Software Upgrade Scenario

See CONFIG MGMT 6a and 6b.

This scenario addresses the upgrade of an ECS COTS application developed by the commercial developer

The ECS Property Administrator receives an upgrade to Scheduler, (a COTS SW application), records the receipt in the Property Management System, and prepares a CCR announcing the upgrade. (NOTE: All COTS SW upgrades are shipped by the vendor to the ECS Property Administrator, rather than to the sites, to ensure vendor compliance with their contracts and to ensure compatibility of COTS versions with other ECS applications). The CCR is forwarded to the SEO, which assesses applicability system-wide and impacts to other ECS applications and resources; tests the upgrade; and prepares a recommendation. Meanwhile, the sites review the CCR and forward their impact assessments for ESDIS CCB decision.

The ESDIS CCB directs that the COTS SW upgrade be installed at all DAACs not later than a specified date. The site's Sustaining Engineer tests (optional) and the Systems Administrator installs the upgrade and reports installation to the site's CM Administrator, who updates the Baseline Manager and records completion of the installation in the Change Request Manager. Once all sites report installation of the upgrade, the ECS System Administrator closes the CCR and reports closure in the next status report to the ESDIS CCB.

4.3.6 System Enhancement Scenario

See CONFIG MGMT 7a and 7b.

This scenario addresses the flow of a system enhancement proposed by a science user or DAAC operator.

A science user calls the User Services Desk suggesting an enhancement to one of the ECS custom toolkits that will enable users faster, more direct access to data products. The User Services Desk records the suggestion on a Trouble Ticket and forwards the Trouble Ticket to the site Sustaining Engineer. The Sustaining Engineer assesses the feasibility, impacts, and resources required, and prepares a CCR with recommendation to the site CCB. The site CCB reviews the assessment and recommendations and takes one of the following actions:

1. If not feasible because of impacts or resource requirements, disapproves the CCR. In such cases, the Sustaining Engineer will report back to the Science User or operator the reasons why it was disapproved and close the Trouble Ticket and CCR.
2. If DAAC unique, disapproves and close the CCR and Trouble Ticket, or approve for DAAC development and implementation. DAAC unique modifications to ECS applications must be forwarded to the SEO for assessment and ESDIS CCB for approval. If approved, the site Sustaining Engineers will develop and maintain the enhancement.
3. If not DAAC unique and feasible, forwards the CCR with assessment and recommendation to the SEO. The SEO will evaluate the suggested enhancement, provide impacts and resource assessments, and provide a recommendation to the ESDIS CCB for decision.

ESDIS CCB-approved enhancements may be developed by the SEO or by the ECS development organization (i.e. SCDO), depending on workloads, release schedules, and functionality. Enhancements may be developed for delivery with a future ECS release or may be delivered between major releases (unlikely).

When development and testing are completed, the site's Systems Administrator installs the new SW version. The site CM Administrator updates the site's Baseline Manager with the new version information and reports its installation in the Change Request Manager. Once all sites report installation of the new version, the ECS System Administrator closes the CCR and reports closure in the next status report to the ESDIS CCB.

4.4 Performance Management Activities

Performance management activities include monitoring, analyzing, and reporting the system operations processes and component performance against pre-defined metrics.

See PERF MGMT 1a through 1l.

The following scenarios illustrate the use of performance management in specific operations activities. Each scenario consists of a text description followed by a table identifying system operator actions.

4.4.1 Operations Support Scenario

See PERF MGMT 2a through 2d.

In this scenario, a problem associated with a PGE causes a large amount of disk space to be consumed. The heavy disk space utilization causes a warning to be generated, which results in the prompt identification of the faulty PGE. Prior to the beginning of the scenario, the performance analyst has already established thresholds for disk space utilization and specified notification mechanisms to be carried out in the event that those thresholds are ever exceeded.

A usage threshold on a unit of the working storage for host Virginia is exceeded. Virginia is the name of the Symmetric Multi-Processor (SMP) Science Processor at LaRC. The processor remains operational while an alert is sent to the host operator screen. The operator receives and acknowledges anomaly message. Having determined that troubleshooting assistance is required, the operator calls the performance analyst (PA) and provides him with the available information.

The PA looks at the usage on the temporary storage and verifies that one of the disks is at 80% utilization. Via queries, the PA determines that 15% of the disk resources were associated with PGE CER042197112004A (the CERES subsystem 4, Cloud Retrieval (release 2.1.)). Via further queries, the PA determines that this PGE normally uses about a tenth as much disk space as it is using now. The PA thinks there is a problem with the execution of the PGE. The PA then calls the operator and reports his findings.

The operator calls a member of the instrument team and discusses the situation with her. She suspects that the PGE has internally detected an error and has shifted to Debug mode. Under the direction of the instrument team analyst, the operator terminates the PGE, saves the associated disk file onto temporary storage and writes a Trouble Ticket.

4.4.2 Preparing for New Algorithm Scenario

See PERF MGMT 3a through 3f.

In this scenario, the planning supervisor knows that a new algorithm will be delivered in the near future and instructs the performance analyst (PA) to develop reports to allow the performance of that algorithm to be carefully monitored.

At the start of the scenario, the supervisor tells the PA that PGE's for a new version of the CERES cloud subsystem (new clouds-during-night-time) will be executed weekly beginning next Monday morning. The supervisor asks the PA to monitor this new subsystem closely and requests daily reports on the PGE's performance. To provide the supervisor with the requested information, the PA creates a request via a GUI to gather and format key variables and email a daily report performance report to him on the CERES specific PGE's. The PA specifies that the report be a compilation of statistics of the last 24 hours and that the report compilation be performed at 6am daily on the day after the PGE's run.

At 6am next Tuesday, the report is compiled and sent to the PA via email. The PA logs in at 8am and reads the email message containing the requested report. The PA reviews the report and takes it to his supervisor.

The supervisor reviews the report. She likes the statistics on each PGE run - the range of run times and system usages, and the summary information which shows the total resources used by these PGE executions. Because she also would like to know what percentage of the science processor capacity is being consumed by running these PGEs, she asks the PA to include this info in the daily report. The PA then modifies the original request to gather the additional information.

At 6am, the report is compiled and sent to the PA via email. The PA logs in at 8am and reads the email message containing the new report, including the additionally requested information. The PA takes the report to the supervisor. Upon reviewing the new report, the supervisor is pleased with the information provided. She states that the disk activity is higher than she expected, and asks for a more detailed breakdown on this. She'd like to see more information on the specific files being used, their sizes, and the types of storage they are using. Since this detail of information is not currently culled from the logs, the PA creates a script to extract the additional information from the logs and includes it in the report.

At 6am, the report is compiled and sent to the PA via email. The PA logs in at 8am and reads the email message containing the newly-revised report, including the more detailed file information requested. The PA compiles the data and takes it to the supervisor. The supervisor is pleased with information being received and asks for it to be provided to her weekly. The PA then specifies via a GUI that the data continue to be gathered daily, but that the report should be sent out weekly to both himself and his supervisor.

4.4.3 Trending Scenario

See PERF MGMT 4a through 4e.

In this scenario, the load on the system, in terms of the number of products ordered, is analyzed to determine any long term trends. This analysis is important to help predict the need for system upgrades to meet user requirements.

The scenario begins when the performance analyst (PA) is informed by his supervisor that the User Services staff has indicated that their workload has increased - lots of users are calling with questions - many are new to the DAAC. She asks PA to investigate and see if there is a similar increase in the number of products being ordered. The PA calls user services (US) to get more details. The US person agrees that things seem busier. He notes that the CERES Science Meeting is coming up next month (December 1998), but that he doesn't think it can all be attributed to that.

The PA decides to first look at the comparison of the products ordered this year prior to the science meeting and last year during the same time. The PA generates a report from the RDBMS through an ad hoc data query. The report generator receives the request, gets the data indicated and generates a report. Upon receiving the report, the PA notices that it shows a 23% increase in products ordered in November of this year (1998) as compared to November of 1997. The PA then decides to look at the overall trend on products ordered over the past year.

The PA generates a new report from the RDBMS via an ad hoc query. The report generator receives the request, gets the data indicated and generates a report. Upon reviewing this report, the PA notices that there has been a modest overall increase in orders leading up to a spike in orders this month (for the meeting). On average, it looks like product orders have increased in the past year by 12%.

The PA then decides to look at the types of products ordered in the past year to look for trends and generates a report from the RDBMS through an ad hoc query. The report generator receives the request, gets the data indicated and generates a report. On reviewing this report, the PA notices that it indicates a mixed bag of information - some products (i.e., CER08 - Level 3 monthly regional radiative fluxes and clouds, and CER15 - Level 3 monthly zonal and global radiative fluxes and clouds) are being ordered more, but orders for others (i.e., CER14 - Level 3 ERBE-like monthly gridded average) have actually decreased. The PA then prepares all of this information into a report and presents it to the manager for possible further action.

The following table summarizes DAAC survey results for desired Performance Management report items.

See PERF MGMT 5a and 5b.

4.5 Security and Accountability Management Activities

4.5.1 Security Management

Security management addresses the protection and control of access to managed resources. It provides the rules and the implementation for authentication procedures, maintenance of authorization facilities, maintenance of security logs, intrusion detection and recovery procedures.

Security management for the TRMM mission addresses the following:

- Management of the authentication and authorization databases
- Compliance management
- Intrusion prevention/detection
- Security event resolution
- Report generation

See SECURITY 1a through 1f.

4.5.1.1 Security Management Scenario

This scenario describes a breakin attempt by a "hacker" from an SCF, and illustrates information flows associated with the reporting of security incidents by a DAAC to the SMC. It further describes how the SMC forwards (reports) the incident to external security agencies such as the CERT and the NASIRC for the purpose of coordination of recovery action; and how security advisories and security directives received from agencies such as the CERT are flowed down to the DAACs. Following is a table identifying the system-operator actions with data exchanged and a scenario text description.

See SECURITY 2a and 2b.

Assumption: The Security Management Application has been set up to send an alert to the Systems Administrator (SA) upon the occurrence of five login failures from any given source. The subnetwork of a user at an SCF is allowed access to ECS.

A “hacker” at the SCF campus (who discovers the hosts at the DAAC) attempts to log into ECS by guessing passwords. The hacker tries a new host after five login failures at a given host. The Security Management Application detects the security events when the established thresholds have been crossed. As a result, the SA receives multiple security alerts. The SA, during investigation, retrieves security events in the events browser window. The SA discovers that the login attempts on the multiple hosts originated from the same host, which is in the same domain as the SCF.

The SA calls the Security Analyst at the SMC and User Services to apprise them of the information. The Security Analyst at the SMC, after verifying the information, calls NASIRC and CERT to report the incident. He is advised to follow up with the MIS manager at the SCF campus; and is sent an electronic advisory to direct all ECS sites to explicitly deny all incoming accesses from the host in question.

The Security Analyst at the SMC forwards the security advisory to User Services and the SAs at all sites. Based on this advisory, the SAs at all the sites modify the network security authorization databases to deny all incoming accesses from the host in question. The Security Analyst reports the event to the MIS manager at the SCF campus who proceeds to have the issue investigated.

4.5.2 Accountability Management

Accountability management for Release A includes the following operations activities:

- User Registration
- User/Security Audit Trail
- Data Audit Trail
- Report Generation

See SECURITY 3a through 3e.

Following are prototype samples of accountability data, reports and operator displays:

See SECURITY 4a through 4q.

4.5.2.1 Accountability Management Scenario

This scenario describes how an approved request for a registered user account (approved via an established approval process) is created, and how the password and instructions on the use of the account are sent to the user.

The Systems Administrator (SA) invokes the user registration sequence, and selects the option to add a new user to the system. The system displays, in tabular form, a list of all the pending requests for registered user accounts, from which the SA selects the entry corresponding to the approved account. The details filled in by the user are displayed, in response to which the SA fills in additional fields, creates the account and assigns a password. Finally the SA prints the account/password details, along with instructions on how to access the account to the newly registered user.

See SECURITY 5a.

4.6 Resource Planning Activities

Resource planning activities include: identification of science operations ground events (e.g., production, testing, training, and maintenance) with associated resource requirements and developing optimum resource allocation plans and schedules based upon approved system configuration priorities.

See RESOURCE PLAN 1a through 1i.

Following are descriptions and system-operator action tables for planning operations resources to support production and ingest operations.

4.6.1 Planning Production Resources Scenario

The assumption made for this scenario is that the Resource Planner receives a list of approved ground events that need to be scheduled. The scenario describes how a Resource Planner interacts with the Planning subsystem in order to integrate the list of approved ground events into a candidate plan. The Planning subsystem is accessed through an interactive user interface and a candidate plan selected. The approved ground events and the associated details are then entered into the system. Based upon inputs provided by the Resource Planner, the Planning subsystem generates a modified candidate plan and displays it on the screen. The Resource Planner may then review the plan with the Production Manager in order to resolve any possible discrepancies.

See RESOURCE PLAN 2a and 2b.

4.6.2 Planning Ingest Resources Scenario

As in the previous scenario, it assumed in this scenario as well that the Resource Planner receives a list of approved ground events that need to be scheduled. This scenario describes how a Resource Planner interacts with the Resource Planning subsystem in order to integrate the list of approved ground events into a plan for Ingest activities. The Planning subsystem is accessed through an interactive user interface and a candidate plan selected. The approved ground events and the associated details are then entered into the system. Based upon the input that the Resource Planner provides, the Planning subsystem generates a plan and displays it on the screen. The Resource

Planner sends a copy of this plan to the Data Archive Manager, who allocates resources according to the Resource Plan. The Resource Planner may then review the plan with the Data Archive Manager in order to resolve any possible discrepancies.

See RESOURCE PLAN 3a and 3b.

4.7 Resource Management and Control Activities

Resource management activities involve monitoring and controlling ECS resources to satisfy operational objectives in accordance with approved priorities and configurations.

See RESOURCE MGMT 1a through 1d.

4.7.1 Data Processing Host Routine Maintenance Scenario

In this scenario, routine maintenance is being performed on a Data Processing Subsystem host. Since the maintenance action is routine, it has been coordinated in advance both with the maintenance technician and, via the resource planning system, with the production monitor. The scenario provides an overview of the interactions between the resource manager, the enterprise management system, and the production monitor. A table identifying the operator-system actions follows the scenario text description.

As the scenario begins, the technician arrives at the prearranged time to perform scheduled maintenance on the data processing host. Upon entering the site, the technician informs the resource manager that he is ready to begin maintenance. The resource manager, unsure of the day's scheduled activities, decides to check the resource planning system to verify that maintenance was scheduled. Upon reviewing the day's resource plan which he has opened on his screen, the resource manager determines that it is in fact time for the scheduled maintenance activity and begins the host shutdown activities.

In order to determine applications are running on the host, the resource manager queries the performance management application. On the resource manager's screen, the performance management application displays list of applications currently running on the specified host. Upon identifying one of these applications as a science algorithm, the resource manager contacts production monitor to determine the plan for that algorithm. The production monitor tells the resource manager that the algorithm should be finished soon, so the resource manager decides to wait until the algorithm is finished before shutting down the host. The resource manager informs the maintenance technician that there will be a slight delay before the host is available for maintenance.

After ten minutes, the science algorithm terminates. The performance management application receives a notification of the algorithm termination and removes the algorithm from the list of running applications. The resource manager notices that the scheduled processing application has terminated and initiates shutdown procedure to take the host off-line. Upon receiving the shutdown command(s), the host goes off-line.

HP Openview detects the state change as the host goes off-line and sends a status message to all affected (registered) operators. On the OpenView workstation, the color of the icon representing the data processing host changes to indicate the off-line status. Upon observing the host icon change color on his HP Openview monitor, the resource manager informs the maintenance technician that the host is now available for the scheduled maintenance activities.

After completing the maintenance actions, the technician informs the resource manager that maintenance actions have been completed, diagnostics checked, and the host is ready to be brought back on-line. The resource manager then initiates the host start-up procedure sending the appropriate start-up command(s) to the host. After the commands have been executed, HP Openview detects the host state change to operational and sends a status message indicating this change in state to all affected (registered) operators. Finally, the host icon color on the resource manager's HP OpenView display turns green to indicate that the host is back on-line.

See RESOURCE MGMT 2a and 2b.

4.7.2 Installation of Software Upgrade

In this scenario, a sustaining engineer is performing a scheduled software upgrade on a host. Since the upgrade is planned, it is included in the daily resource plan for the host that has been sent to the host operator. This scenario provides an overview of the interactions between the resource manager, the sustaining engineer, and the host operator. A table identifying the operator-system actions follows the scenario text description.

As the scenario begins, the sustaining engineer informs the resource manager that he is ready to perform the scheduled software upgrade. The resource manager verifies that the upgrade was scheduled by looking at a copy of the resource plan for that host that he had printed out earlier in the day. The resource manager then begins the host shutdown procedure.

The resource manager queries the performance management application to determine what applications are currently running on the host. The performance management application displays list of several applications currently running on the specified host. The resource manager contacts the host operator to remind him of the planned outage. The host operator receives the message terminates the appropriate applications.

Once the applications terminate, the performance management application removes them from the list of running applications. Upon receiving an indication that the applications have terminated, the resource manager initiates the shutdown procedure to take the host off-line. The host then receives the shutdown command(s) and goes off-line.

HP Openview detects the host state change to off-line, sends a status message to all affected (registered) operators, and changes the color of icon representing the host on the HP OpenView workstation to reflect the off-line status. The resource manager observes host icon color change and informs the sustaining engineer that the host is now available for upgrade.

After completing the upgrade, the sustaining engineer informs the resource manager that the upgrade is finished, the appropriate diagnostics checked, and the host is ready to be brought back on-line. The resource manager then initiates the host start-up procedure sending the appropriate

start-up command(s) to the host. After the commands have been executed, HP Openview detects the host state change to operational and sends a status message indicating this change in state to all affected (registered) operators. Finally, the host icon color on the resource manager's HP OpenView display turns green to indicate that the host is back on-line.

See RESOURCE MGMT 3a and 3b.

4.8 Science Data Ingest Activities

Science data ingest at ECS DAACs includes data transfer, validation, conversion, storage of Level 0 data and insertion of higher level data into the Data Server. The modes of ingest, i.e., TRMM Level 0, ancillary, media, and Version 0 data migration is further defined in the following paragraphs. The objective of the following paragraphs is to demonstrate the ingest and data integrity checking process is largely automated, however DAAC operation's staff is required to support media operations, resolve problems, periodically monitor input operations, and coordinate with the appropriate external/internal sources to resolve resource schedule conflicts.

See DATA INGEST 1a through 1n.

4.8.1 TRMM Level 0 Data Ingest Scenario

See DATA INGEST 2a.

This scenario describes the normal ingest of TRMM Level 0 data from the Sensor Data Processing Facility (SDPF), which will be accomplished without direct operator action. All messages transferred between subsystems and between processes within the Ingest Subsystem are sent to log files which may be monitored or viewed by operations personnel. The SDPF will send a Data Availability Notice (DAN) to the Ingest Subsystem indicating that data is ready for transfer. The DAN identifies parameters such as data source, number of files, and location of data, and a summary of the DAN contents is placed in the event log. The Ingest Subsystem generates a corresponding ingest request and stores the request on a prioritized list. A Data Availability Acknowledgment (DAA) is sent from Ingest to the SDPF indicating readiness to ingest the data identified in the DAN. The ingest function ensures that all required devices are allocated and schedules and performs the data transfer. Data transfer status, including all recoverable errors, is indicated in the event log. Once the data transfer is complete, the ingest function extracts the SDPF Level 0 metadata and checks selected metadata parameters (e.g., SFDU header information). The status of the metadata parameter check is written to the event log. The ingest function then generates a data server insert request to store the SDPF Level 0 data and metadata in the Level 0 data repository. Subscriptions (if any) are triggered to indicate the availability of data once the archive process is completed. A Data Delivery Notice (DDN) is sent to the SDPF indicating that the archiving of the data identified in the DAN has been completed. The SDPF returns a Data Delivery Acknowledgment (DDA) in response to the DDN and terminates the SDPF/Ingest Subsystem session. Ingest provides a status message to the Ingest History Log when the transaction is complete.

The following table identifies system-operator actions during Level 0 ingest.

See DATA INGEST 3a through 3d.

4.8.2 TRMM Data Ingest "Fault" Scenario

This scenario injects some possible fault conditions into the nominal TRMM Level 0 Ingest Scenario to show system and operator actions taken in response to anomalies during data ingest. The first example of a fault condition is the receipt of an incomplete or damaged DAN from the SDPF. The ingest software automatically returns a DAA indicating that the DAN was invalid and requests a retransmission. The second fault condition example occurs when required resources cannot be allocated to satisfy an ingest request. This condition requires that the resource manager be notified for resolution of the problem. The third fault condition occurs when a network error prevents sending the DAA. If a system-tunable number of automated retransmission attempts fail the ingest technician will be notified and will generate a trouble ticket. The fourth fault condition involves a failure during data transfer. After a system-tunable number of retries, a DDN indicating failed transfer is sent to the data provider and ingest technician. The ingest technician will attempt to identify the problem and will either generate a trouble ticket on a failed device or will notify the resource manager to resolve the problem. The fifth fault condition example finds a metadata parameter out of range during the metadata validation process. The system flags the parameter as out of range and notifies the Quality Assurance Manager (QAM) of the condition. The QAM provides an off-line analysis of the problem and determines if the data is in error and is a subsequent retransmission must be requested. The sixth error condition example involves the failure of a Level 0 data repository insert request. The ingest technician is notified of the failure and attempts to resolve the problem. The final error condition example involves the sending of a DDN after archiving is complete, but not receiving a corresponding DDA. A system-tunable number of DDN retransmission attempts are automatically initiated. If these attempts fail, the ingest technician and resource manager will be notified to resolve the problem.

System-operator responses to an ingest fault are identified in the following table.

See DATA INGEST 4a through 4d.

4.8.3 TRMM Ancillary Data Ingest Scenario

See DATA INGEST 5a.

The following scenario describes the manner in which TRMM ancillary data is ingested into ECS. The ingest polling client periodically checks an agreed-upon network location for a Delivery Record file. The Delivery Record file contains information similar to that in a DAN, and describes the location of the available data. All data at the specified location are assumed to make up a collection of ingest data with one file per data granule. If a Delivery Record is located, the ingest function generates a corresponding ingest request and stores the request on a prioritized list. If data is located at the specified location, the ingest function automatically performs an ftp get from the source within a system-tunable time window. Format conversion, as required, is performed on the ingested data, as well as metadata extraction and validation. The ingest function then generates a data server insert request to store the data and metadata in the Level 0 data repository. Subscriptions (if any) are triggered to indicate the availability of data once the archive process is completed. The polling ingest client resets the polling interval and enters a wait state. Ingest provides a status message to the Ingest History Log when the transaction is complete.

System-operator actions are summarized in the following table.

See DATA INGEST 6a through 6d.

4.8.4 Hard Media Ingest Scenario

See DATA INGEST 7a.

The following scenario describes the manner in which data received on hard media is ingested into ECS. Media that is received at the DAAC is checked for readiness to ingest. The ingest technician compares the received media to a media ingest readiness checklist and invokes the ingest client s/w via the GUI once the media has been readied. A device allocation is requested from the Data Server peripheral pool. The ingest technician receives the device id and is prompted to mount the media. The existence of a Delivery Record file describing the media contents is checked and a summary of the Delivery Record contents is logged. The data is transferred from media to working storage, and basic metadata extraction and validation is performed. The ingest function then generates a data server insert request to store the data and metadata in the Level 0 data repository. Subscriptions (if any) are triggered to indicate the availability of data once the archive process is completed. Email notification of successful ingest is sent to the data provider if a network address is available.

System-operator actions required to ingest hard media are summarized in the following table.

See DATA INGEST 8a through 8c.

4.8.5 Version 0 (V0) Data Ingest Scenario

See DATA INGEST 9a.

The following scenario describes the mechanism for ingest of Version 0 data. Version 0 data preparation, format conversion, etc. will be accomplished by the V0 migration facility. This facility consists of a string of hardware and software at each DAAC that supports the preparation of Version 0 data into a form that may be ingested by the standard ingest client software. The electronic ingest scenario for the ingest of Version 0 data subsequent to preparation by the Version 0 migration facility is similar to that for TRMM Level 0 data ingest (scenario 4.8.1). The ingest of Version 0 data via hard media is similar to the hard media ingest scenario described above.

The following table identifies system-operator actions during the V0 ingest process.

See DATA INGEST 10a through 10c.

4.9 Science Data Archival Activities

The ECS Data Server subsystem provides automated archive and non-critical data ingest. DAAC operations staff support is required for data server administration, monitoring, and problem resolution.

See DATA SERVER 1a through 1l.

4.9.1 Data Insertion Scenario (nominal)

See DATA SERVER 2a.

The Product Generation Subsystem requests a Data Insert operation at the Data Server. Data Server verifies that the associated metadata is valid. For valid metadata the data is inserted into the archive and the metadata inventory is updated. The Subscription Server is then notified of the data availability. The Subscription server, in turn, notifies all subscribers of the data availability. The process is fully automated and requires no operator involvement.

Following is a table summarizing system-operator actions.

See DATA SERVER 3a and 3b.

4.9.2 Data Insertion Scenario (fault)

The Product Generation Subsystem requests a Data Insert operation at the Data Server. Data Server verifies that the associated metadata is valid. A fault occurs during metadata validation. The metadata is found to be invalid. The data may be archived or discarded depending on the DAAC policy. The requester and the operator are notified. The process is fully automated and requires no operator involvement.

Following is a table summarizing system-operator actions in response to insertion faults.

See DATA SERVER 4a.

4.9.3 Data Archive Configuration Maintenance Scenario (Post Release A Activity)

Regular media check indicates that a tape refresh is required. The operator is notified and schedules a refresh operation, loads clean media and extracts the old tape cartridge(s).

The following table summarizes system-operator actions.

See DATA SERVER 5a.

4.10 Science Data Distribution Activities

The DAAC data distribution technician (DDT) is required to support physical media distribution (e.g., U.S. mailing of a 8 mm tape), resolve problems, monitor electronic distribution operations, and coordinate with the appropriate external/internal sources to resolve distribution conflicts.

See DATA SERVER 6a and 6b.

4.10.1 Network Data Distribution (Pull) Scenario (nominal)

See DATA SERVER 7a.

A user connects to the system and performs a search for a specific data product. When the system notifies the user that the product is found, the user requests an ftp pull of that data (No

reformatting or subsetting is available in Release A.) The data is retrieved from the archive and placed on the Data Server staging disk. The user is notified of the data readiness and now has a DAAC-set period of time to retrieve the data. The data will be deleted from the staging disk after an operator confirmation (the confirmation can be turned off).

The following table summarizes system-operator distribution actions.

See DATA SERVER 8a through 8c.

4.10.2 Network Data Distribution (Push) Scenario (nominal)

A user connects to the system and performs a search for a specific data product. When the system notifies the user that the product is found, the user requests an ftp push of that data (the user supplies all the necessary security information that would enable placing the requested data directly on the user's system. (No reformatting or subsetting is available in Release A.) The data is retrieved from the archive, placed on the Data Server staging disk and then placed on the user's system The user is notified of the data placement completion. The data will be deleted from the staging disk after a DAAC-established time interval elapses.

The following table summarizes system-operator distribution actions.

See DATA SERVER 9a through 9c.

4.10.3 Network Data Distribution (Push) Scenario (fault)

A user connects to the system and performs a search for a specific data product. When the system notifies the user that the product is found, the user requests an ftp push of that data (the user supplies all the necessary security information that would enable placing the requested data directly on the user's system). (No reformatting or subsetting is available in Release A.) The data is retrieved from the archive, placed on the Data Server staging disk. Data Server connects to the user's system and begins data transfer. A fault occurs at this time severing the link to the user's system. Data server retries N times (where N is determined by DAAC policy). If none of theretries are successful, an e-mail indicating request failure is sent to the requester, and the data transfer is terminated. The data will be deleted from the staging disk after a DAAC-established time interval elapses.

The following table summarizes system-operator actions in response to faults.

See DATA SERVER 10a through 10c.

4.10.4 Hard Media Distribution Scenario

A user requests a hard media shipment of specific data. (No reformatting or subsetting is available in Release A.) The data is retrieved from the archive, placed on the Data Server staging disk. Operator loads the appropriate peripheral device, allocated by the system, with media and indicates readiness to the system. The data is transferred to the appropriate media, the packing list is generated automatically. The operator prepares the shipping labels (automatic label preparation post-Release A), packages and ships the media to the requester. If an e-mail address is available, the user is notified of the request having been filled. The data will be deleted from the staging disk after a DAAC-established time interval elapses.

The following table identifies system-operator actions to accomplish distribution on hard media.

See DATA SERVER 11a through 11c.

4.10.5 Network Data Distribution (Push) Scenario (Request From Hell)

The mechanism for Network "Push" Distribution is a File Transfer Protocol (ftp).This scenario describes the process and affected components when data is requested for distribution via an external network and the request size exceeds the maximum number of files permitted in a request or the maximum capacity of the distribution system. Configurable parameters will exist for the maximum number of bytes in a request, and the maximum number of files in a request. The Distribution Management software will check each request against these limits. A request which exceeds either limit will be suspended with a new state of OPINT, indicating operator intervention required; the operator will also be notified of the existence of the request. The requester will be notified that the request has been suspended because its size requires operator intervention and that the request will be processed as subrequests which will be delivered to the requester individually. The operator can view the details of the request via selection of a view function, which exists in the Release A CDR design and will be augmented to support operator sectioning of these large requests.

The display of the details of a distribution request will include a list of the granules and files in the request, and their individual sizes and types. The operator will be able to position a cursor within this list to delimit (via a GUI-supported selection such as a Delimit button) where the request should be sectioned into multiple requests (termed subrequests). The operator will then be able to submit (via a GUI-supported selection, such as a Submit button) - at his discretion - each of these subrequests for processing. For data push operations, data will be staged to Working Storage and then transferred to the requestor. The distribution request specifies the necessary system, path and security information to allow the transfer. Each submitted subrequest will be processed as an independent request, with generation of its own packing slip (if the distribution is via physical media) and notification to the requester when distribution is complete, with the notification also indicating the parent request of this subrequest. Notification to the requester of completion of the last subrequest will also indicate completion of the entire (parent) request. A "Request from Hell" Network Push Distribution Scenario is described in Table 4.10-1.

Purpose and Precondition:

A user connects to the system and performs a search. The working collection created from the search is large and the user decides to acquire via ftp push the entire working collection. The request is too large, based on system configurable parameters and is partitioned by the DDIST Technician and sent to the user as appropriate.

Table 4.10-1. Network Data Distribution (Push) Scenario (Request From Hell) (1 of 3)

Step	Operator/User	System	Purpose
1	A user establishes a client session to a Data Server and creates a working collection of data.	The Data Server assigns a session ID and logs the initiation of the session. The Data Server logs and queues the search request sent by the user to create a working collection and searches the Metadata Database in accordance with the user's indicated search attributes when the request is reached in the request queue. Identified granules are returned to the user's working collection.	Establish a Data Server session an initiate a search.
2	The user is interested in all data in the working collection, and an acquire (via ftp push) service to obtain all granules.	Distribution Management logs the Acquire Via ftp Push Request and detects the request exceeds configurable size parameters. The request is suspended with a status of OPINT, the operator is notified that the request requires operator intervention, and the user is notified the request exceeds size parameters and will be processed as separate subrequests.	Acquire this data.

Table 4.10-1. Network Data Distribution (Push) Scenario (Request From Hell) (2 of 3)

Step	Operator/User	System	Purpose
3	The Data Distribution (DDIST) Technician views the request.		Examine request and determine problem and corrective action.
4	The DDIST Technician selects a subset of the request from the distribution request details and submits this subset.	Distribution Management logs the Acquire Via ftp Push Request and sends a Data Retrieval Request to Storage Management listing the granules to be retrieved and placed on Working Storage.	Subrequest generated and submitted.
5		Storage management logs and queues the Data Retrieval Request. When the request is reached in the request queue, Storage Management requests the appropriate granules be retrieved from the archive via the Archive Management OTS Product. The granules are placed on the Working Storage and a Data Retrieval Request completed message is logged and sent to Distribution Management.	Retrieve the appropriate granules and place them on the user push volume.

Table 4.10-1. Network Data Distribution (Push) Scenario (Request From Hell) (3 of 3)

Step	Operator/User	System	Purpose
6		Distribution Management provides login, system, and security information received in the Acquire via ftp Push, to Storage Management. Storage Management utilizes CSS Services to push the high interest granules to the user's system. Distribution Management logs a distribution complete message and sends a distribution completed notification to the client or emails the user if no client is active.	Distribute data and notify user that data is available.
7	The DDIST Technician submits each subsequent subrequest and steps 5 & 6 are repeated until the original distribution request is fulfilled. The operator does not have to wait for the first subrequest to finish before submitting the next one, nor does he have to submit the next one immediately after the first one completes. Request submissions are completely at the operator's discretion and should be based on available resources.	When processing of the final subrequest is complete the notification which Distribution Management provides to the requester indicates that all subrequests into which the request was sectioned have now been processed.	Continue distribution of the subrequests until the original request if completed.

4.11 Production Planning Activities

Science data production planning includes the population and maintenance of the production planning data base, creation of alternate candidate production plans based on predicted input data and resource availability schedules, and the management of the "active" production schedule. The production planning process is automated, however aided by an operator to assist in the plan activation, modification and coordination.

See PROD PLAN 1a through 1j.

4.11.1 Routine Production Planning Scenario

The following scenario provides a view of the operational activities and tools associated with planning for production processing during routine operations. The scenario highlights the following operational characteristics.

The initialization of the planning database with PGE related information occurs during the AIT activity at the DAAC.

Planning generates a 30 day plan that is produced and published every two weeks. The 30 day plans are not updated and reissued between the two week publications points.

Planning also generates a 10 day plan every week. Like the 30 day plan, the 10 day plan is not updated between publication points.

Plans are published via subscription to the EOSDIS community.

The Resource Manager communicates resource requirements to Production Planning for ground events, such as maintenance and upgrades.

Data availability information is used by Planning to predict data arrival times. This and other information, such as PGE characteristics is used to predict and PGE start and stop times in the plan.

The Daily Schedule is generated from the planning database and reflects the current status. Replanning of the daily schedule may be performed as determined necessary by the Production Scheduler. The schedule does not drive processing by itself - processing reflects the schedule and the data arrival pattern.

Data arrivals trigger subscription notifications to Planning. Production jobs are only dispatched to processing when all required data and processing resources are available.

The Planning subsystem does not impose any particular planning timeline for all DAACs. Each DAAC may tailor the planning timelines to their needs. The one month and one week timelines presented in the scenarios are provided as reasonable options.

See PROD PLAN 2a through 2d.

4.11.2 Replanning Production Scenario

This scenario provides a view of the operational activities and tools associated with a replanning event for production processing resulting from the failure of a processing component. The scenario highlights the following operational characteristics.

Tools are provided to allow operations to evaluate the impact of schedule changes and thereby assess plan change options before executing the change.

Adjustment of priorities for production jobs is a standard and easily accessible method within the Planning subsystem for achieving certain processing objectives.

Replanning can be performed to prepare and publish a new plan for the day that reflects the current situation.

See PROD PLAN 3a and 3b.

4.12 Production Processing Activities

A science data processing request is automatically executed upon arrival of all required input data and availability of computing resources. The DAAC production monitor operator is required to monitor production operations, resolve production execution problems and coordinate with the appropriate external/internal sources to resolve resource schedule conflicts and data delays.

See PROD PROC 1a through 1f.

4.12.1 Production Processing Job Anomaly Scenario

The following scenario provides a view of the operational activities and tools associated with a production processing job anomaly. The scenario highlights the following operational characteristics.

Production operations personnel are primarily involved with monitoring the progress of production jobs to identify and react to anomalies. Operator activity is not required to normally required to start or stop individual jobs.

Alerts are provided to operations when production job processing time departs from the expected.

Operations personnel can inspect the current status of processing jobs and can kill jobs as they determine necessary.

See PROD PROC 2a through 2c.

4.12.2 Production Processing Job Abnormal Termination Scenario

This scenario provides a view of the operational activities and tools associated with a production processing job that ends abnormally. The scenario highlights the following operational characteristics.

Alerts are provided to operations when production jobs end abnormally.

Operations will supervise the destaging of data files resulting from jobs having abnormal ends. Files are destaged to local storage of the data server. Capabilities are provided within the Processing subsystem to track and destage these files.

See PROD PROC 3a and 3b.

4.13 User Services Activities

User Services Activities, while largely automated, still require human interface between users and the ECS user services staff. DAAC User Services staff are required to support order tracking, help in creation of new users, resolve user requests/problems, initiate/track system non-

conformance reports and coordinate with the appropriate external/internal sources to resolve user issues/problems. The added value of Release B functionality is presented in the scenarios in this section while demonstrating the Release A features.

See USER SERVICES 1a through 1e.

User Services functions routinely require access to different information fields on data displays/reports as opposed to what information Operations staff may require (users telephone # vs. users IP address). User Services Working Group (USWG) has provided the following list of system functions desirable for User Services' staffs within the DAACs. Although many of these functions will be available in the Release A time frame on a DAAC-specific basis, few will be available until later releases as part of a single integrated package. Each function is annotated with the capabilities to be provided with Release A:

User Transaction functions: The provision of order tracking and financial accounting information will be DAAC-specific capabilities in Release A (ECS will not provide accounting information in Release A). Release A on-line help will be provided through the World Wide Web (WWW) based IMS home page (currently http://harp.gsfc.nasa.gov:1720/eosdis_documents). Cross-DAAC information sharing will be provided via the advertising service and html links from the IMS home page to the DAAC-specific home pages.

Data Set Histories: The provision of data set histories will be a DAAC-specific capability in Release A.

Library/Advertising Functions: Consolidated guide information will be available through the Release A (V0) Client. Constant login will not be required for ready access to this information since it will be WWW based. Maintenance/modification of this information will be a DAAC-specific function in Release A.

Feedback Mechanisms: A user-feedback mechanism will be available through the Release A (V0) Client. The feedback will be routed to a specific DAAC User Service as appropriate.

User Notification Tools: Specific data re-processing notification will be a DAAC-specific function in Release A.

Subscription Lists: Subscription lists will not be available in Release A.

Access to Archive Information, Metadata, and User Tools: Access to archive information, metadata, and user tools will be available to User Services through the Release A (V0) Client in the same manner that they are available to the users.

System Status Information: System status will be available through the Release A (V0) Client on a server is up/down basis.

DAAC-Unique Extensions: DAAC-unique extensions will be available on a DAAC-specific basis via mechanisms such as telnet or WWW in Release A.

4.13.1 End-to-End Order Tracking Scenario

This scenario describes how User Services tracks a user's request, checks on the status of an order and routinely checks on status of all Data Server pending orders within a DAAC.

See USER SERVICES 2a.

4.13.2 Standard Procedures (Login) Scenario

This scenario describes how the login procedure (incorporated in an HTML document) is given to a user and suggests that DAAC-unique procedures can be added to the document by User Services.

See USER SERVICES 3a.

4.13.3 System Status Scenario

This scenario describes how a User Services representative would respond to a user's call to report a problem and use the Network Monitor System to investigate the cause of the problem.

See USER SERVICES 4a.

4.13.4 Place an Order for a Potential User Scenario

This scenario describes how a User Services representative might place an order acting as a proxy agent for a reticent or new ECS user via the Release A (V0) Client.

See USER SERVICES 5a.

4.13.5 Non-Conformance Report Scenario

This scenario describes how a User Services representative would initiate an ECS problem report based on a user called-in (or e-mailed) advice of system non-conformance.

See USER SERVICES 6a.

4.13.6 Lost User Password Scenario

This scenario describes how a User Services representative would help a user who has forgotten his password to reestablish a temporary password via a policy driven user verification procedure.

See USER SERVICES 7a.

4.14 Science Software Integration & Test Activity

ECS Release A is responsible for providing tools and scripts to facilitate the Science Software Integration and Test (SSI&T).

4.14.1 Goals of SSI&T

Because the science data production software (SDP Software) is developed independently of ECS at other facilities (Science Computing Facilities, or SCFs), which may employ different computing hardware and different operating systems, the SSI&T process is mandated. The principal goals of the I&T of the SDP Software, to be achieved in the TRMM Release, are to integrate the software within a homogeneous environment, to test its ability to run to normal completion repeatedly over the normal range of data inputs and run-time conditions, and to ensure that the SDP Software executes without interfering with other software executing at the DAAC, or with DAAC operations. SSI&T will be performed at each DAAC responsible for its respective product generation.

Subordinate goals of SSI&T include

- Refining the process to arrive at efficient and effective procedures, reviews, organizational responsibilities, support and use of tools (Ir-1 and later ECS releases).
- Demonstrating the portability of the SDP Software through the adherence to standards and the use of the Science Data Processing (SDP) Toolkit (Ir-1 and later ECS releases).
- Determining the production resource requirements for the SDP Software such as CPU time, RAM, and temporary storage (ECS TRMM Release and later).
- Testing of SDP Software interfaces external to the DAAC such as communications, log files and QA data with the SCF. Another important interface is the input of ancillary data to the SDP Software (ECS TRMM Release and later).

4.14.2 SSI&T Procedures

In general, the SDP Software is developed by an Instrument Team (IT) or other investigator at their own Science Computing Facility (SCF) to be run at a DAAC. The SDP Software will eventually need to be transferred to the DAAC and undergo the SSI&T process before being placed into production. The detailed steps will vary from DAAC to DAAC, and will most likely be specifically tailored to the science software. The following steps, however, will be performed as part of any SSI&T efforts:

a. The IT and DAAC will coordinate the SSI&T schedule to ensure that adequate staff and system resources are available to support the delivery of the science software.

b. The IT transfers the SDP Software and associated materials to the DAAC. The ITs deliver their source code, coefficient files, test data, and documentation to the DAAC.

c. The SDP Software is placed under SSI&T software configuration management after the software delivery to the DAAC. This is necessary to maintain traceability between what was delivered and any changes made to the software during the SSI&T process.

d. The SDP Software must be compiled and linked with the DAAC version of the SDP Toolkit. The DAAC version of the SDP toolkit contains actual links with the ECS processing software which were only “stubs” in the toolkit version available to the SCF. The calling sequences are identical between the DAAC and SCF toolkit versions, however.

e. Standalone test cases will be run employing the suite of test data provided by the IT. This step verifies that the output of the science software at the DAAC is the same as that obtained at the SCF. Resource usage is measured during these tests.

f. The SDP Software information is entered into the Planning Data Base. This information includes Product Generation Executive (PGE) identifier and version number, input and ancillary data dependencies, activation rules, and the resource profile.

g. Operational testing will be performed. Prior to launch, simulated data supplied by the IT will be used. For post-launch deliveries of SDP Software upgrades, a period of testing in parallel with the current production version will be performed.

Steps (a) through (e) will have been performed for SDP Software tested with Ir-1. Steps (f) and (g) are introduced as part of the SSI&T process concurrent with the ECS TRMM Release.

4.14.3 Schedule and Expected State of SDP Software Development

The CERES and LIS instruments are to be flown on the TRMM spacecraft, and product generation using the observed data from these instruments is to begin under ECS TRMM Release. The expected schedule and status for delivery of the SDP Software of these instruments is summarized in Table 4.14-1.

Table 4.14--1. TRMM Instrument SDP Software Deliveries for TRMM Release

Instrument	SSI&T DAAC Site	Status of Science Software at TRMM Release
CERES	LaRC	The CERES IT will have the Release 2 of their SDP Software, with the SDP Toolkit fully integrated into their software—including HDF or extensive error and exception handling. Pre-launch testing will employ two month's worth of test data (each 17 GB in size).
LIS	MSFC	The LIS IT expects to have their program for the generation of Level 1-3 Standard Products essentially done by the Ir-1 Delivery. Therefore, their Version 2 Software will be fairly "operational robust". Simulated Level 0 data will be based on raw data from the Optical Transient Detector (OTD) Instrument, an engineering prototype of LIS, flown earlier.

In addition to SSI&T of the launch-ready versions of the SDP Software for the instruments on the TRMM spacecraft, SSI&T will be performed for the “engineering” version deliveries of SDP Software for the instruments of the EOS AM-1 mission. The expected schedule and status for delivery of the SDP Software of these instruments is summarized in Table 4.14-2.

Table 4.14-2. AM-1 Instrument SDP Software Deliveries for TRMM Release

Instrument	DAAC	Status of Science Software at TRMM Release
ASTER	EDC	The ASTER Version 1 delivery will have all of their Level 2 Modules ready at Ir-1., and include HDF, extensive error handling and most of the interfaces to external data sets.
MISR	LaRC	The MISR Team's Version 1 delivery will consist of the overall structure of the MISR processing system, and the individual PGE elements which work within the overall shell, including error handling and EOS-HDF.
MODIS	GSFC, EDC	MODIS Team will have integrated software for generating Level 1, 2 and 3 products with their Version 1 delivery.
MOPITT	LaRC	MOPITT Team will have all of their Level 2 Software ready with their Version 1 delivery. They will have simulated MOPITT data (aircraft sensor data), and they will also have ancillary data (e.g., NMC analysis data).

In addition to the above, the SAGE III instrument, to be flown on a METEOR spacecraft shortly after the launch of AM-1, will have a Version 1 delivery to the LaRC DAAC for SSI&T. The details of this are yet to be developed as of the time of this publication.

4.14.4 SSI&T Tools

SSI&T is a manually intensive process. Many tools will be provided, however, to assist in performing the SSI&T steps.

Although many of the needed capabilities (see Table 4.14-3) will have already been provided by Ir-1, it will be necessary to revisit the tool selections prior to the fielding of the TRMM Release. At the time COTS tool selections were made for Ir-1, the hardware vendors' transition from a 32 bit processing hardware architecture to 64 bits was not complete and so no third-party COTS products were available. Consequently, heavy reliance for the Ir-1 selections was made on the tools provided by the selected hardware vendors. By the time of TRMM Release, additional, third-party COTS products should be available for 64-bit hardware platforms.

Table 4.14-3. SSI&T Tool Capabilities

Service	User Capability Enabled by Tools	Release First Provided
Data Ingest	receive science software delivery*	TRMM
Management	configuration manage delivered science software	Ir-1
	problem tracking	TRMM
Data Processing	examine delivery for completeness	Ir-1
	check for compliance to standards	Ir-1,TRMM
	compile and link delivered source files	Ir-1
	run test cases	Ir-1
	examine test outputs, including metadata	Ir-1,TRMM
	detect errors	Ir-1
	collect resource requirements statistics	Ir-1
	update system databases	TRMM
	write reports and maintain logs	Ir-1
	write additional ad hoc tools	TRMM

4.15 Trouble Ticketing / Problem Tracking Activities

Trouble ticketing provides the capability for users and operators to report and track problems that are identified in ECS. The trouble ticketing service allows users and operators to enter trouble tickets via an HTML form that captures the minimal essential data required for each trouble ticket. ECS operators can also submit trouble tickets directly via the trouble ticketing application. The trouble ticketing application will create an entry for each trouble ticket that will contain information such as the current status of the trouble ticket, the person to whom the trouble ticket is currently assigned, and a resolution log listing details of steps taken to resolve the problem. The trouble ticketing application is also capable of sending automatic e-mail notifications to interested parties (e.g., trouble ticket submitter, resource manager) at operator-configured times. Trouble ticketing activities are largely policy-driven, and the trouble ticketing application has the flexibility to handle deviations from the scenario presented below.

4.15.1 Trouble Ticketing Submission and Resolution Scenario

In this scenario (see Trouble Ticket Scenario), a user discovers a problem in ECS. The user goest to the ECS Trouble Ticketing Home Page and opens an HTML form for submitting ECS trouble tickets. The trouble ticketing application automatically populates the form with user-specific information, such as e-mail address, name, and phone number. The user enters a description of the problem on the HTML form and indicates the problem's impact on the user. Once finished entering this information, the user submits the trouble ticket to the ECS trouble ticketing application.

The trouble ticketing service receives the user-generated information and imports it into a new trouble ticket database entry. The trouble ticketing service automatically generates a unique trouble

ticket number for purposes of identifying the trouble ticket. It then sends this number back to the user as part of a confirmation message that is sent via HTML.

Whenever a new trouble ticket entry is created, the resource manager is automatically notified by the trouble ticketing service. The resource manager opens the new trouble ticket, examines the problem description, assigns a trouble ticket priority, changes the trouble ticket status to "Assigned," and assigns the trouble ticket to a technician. The trouble ticketing service then updates the trouble ticket entry to reflect these changes. In addition, the trouble ticketing service sends an e-mail notification to the user to indicate that the trouble ticket has been assigned.

Once the trouble ticket has been assigned, the trouble ticketing service notifies the assigned technician via e-mail. The technician diagnoses the problem, realizes that it will take some time to resolve, and updates the trouble ticket resolution log to indicate the proposed course of action. The technician also changes the trouble ticket status to "In Progress" while continuing to work the problem.

Once the technician is able to successfully resolve the problem, the technician enters a summary of the actions performed in the problem resolution process along with any other relevant notes, including the fact that the problem has been fixed, in the trouble ticket resolution log. The technician also changes the assignment field to "Resource Manager." The trouble ticketing service then updates the trouble ticket entry and sends e-mail notifications to both the submitter and the resource manager indicating that the trouble ticket has been proposed for closure.

The resource manager reviews the trouble ticket and presents it to the review panel for approval. Any comments received from the submitter regarding the proposed problem resolution are also presented to the review board. Once it has determined that the trouble ticket has been adequately resolved, the review panel approves the status chaπnge. The resource manager then changes the trouble ticket status to "Closed." The trouble ticketing system updates the trouble ticket entry and sends the user a final e-mail notification indicating that the trouble ticket has been officially closed.

See TROB TICKET 1a and 1b.

5. Site Overviews

This section provides overviews of the activities at each Release A DAAC. Each section is constructed in a similar fashion (see Table 5-1).

Table 5-1. Structure of Site Overviews

Section	Title	Content
5.X.1	Mission and Operations Activities	These sections list the operations performed using ECS components for Release A on a site specific basis. The activities are at a summary level. The discussion shall include what is provided by the system and what the operators perform. For a summary of a specific mission, in some cases across DAACs, see Section 3.
5.X.2	Key Interfaces	These sections list the key interfaces for carrying out the missions supported by the site. For complete description of the relevant interfaces, see the appropriate Interface Requirements Document or Interface Control Document.
5.X.3	Day in the Life	The operations for a nominal day at each site are described. The descriptions of this section make use of the activities described in Section 4, e.g., an activity may be performed 3 times in a nominal day at a site.

The Release A DAACs addressed in this section are:

- Distributed Active Archive Centers (DAACs):
  - Langley Research Center (LaRC) — Hampton, Virginia
  - Marshall Space Flight Center (MSFC) — Huntsville, Alabama
  - Goddard Space Flight Center (GSFC) — Greenbelt, Maryland

The ECS contractor does not conduct operations at EDC during Release A. The ECS contractor is not required to install, operate, or maintain hardware and software at EDC. The government will provide ECS developed software and documentation to EDC. The ECS contractor will provide technical consulting services to EDC in support of ECS software integration into the EDC hardware environment.

5.1 Langley Research Center (LaRC)

This section describes the activities at the ECS portion of LaRC during the operation of ECS Release A.

5.1.1 LaRC Release A Missions

The following are the Release A missions for the LaRC DAAC.

- CERES data ingest, production, archive and distribution
- SAGE III, MISR, and MOPITT algorithm integration and test
- CERES algorithm updates integration and test
- AM-1 interface test support
- V0 data migration, archive and distribution
- Transition to Release B baseline
- Above activities parallel to V0 operations

5.1.2 TRMM Mission (Release A) Key Interfaces: LaRC DAAC - ECS

See LARC 1a on the following page.

5.1.2.1 ECS/LaRC to SDPF Interface

The following is a summary of the interface activities:

- CERES data is received once per day within 24 hours of last acquisition session
- SDPF notifies LaRC of availability of CERES
- LaRC "pulls" CERES data from SDPF, i.e., FTP
- LaRC acknowledges successful receipt of data
- SDPF retains L0 data for 5 days
- SDPF retains CERES raw data for 2 years

5.1.3 Day in the Life of ECS at LaRC DAAC

The purpose of this day in the life scenario is to illustrate typical activities, their frequency of occurrence during the Release A time frame, and the types of coordination and actions required by members of the operations and engineering staff. The day described at the LaRC DAAC is Monday, 23 Feb 98.

Planned for that 23-Feb-98 at LaRC are:

- Routine management and engineering activities including daily and weekly status meetings conducted by the ECS senior manager and supported by members of the engineering and operations staff.
- Routine operations, including production planning, data ingest, product generation, product archive, product distribution, user services, etc. A larger than normal backlog of product generation and data distribution is waiting for the operations staff because of network problems over the weekend.

- LaRC local testing by members of the LaRC sustaining engineering staff.
- TRMM/CERES SW maintenance test by the CERES SCF team, supported by the DAACs algorithm integration support personnel.
- ECS system testing conducted by a Sustaining Engineering Organization (SEO) test director and supported by LaRC sustaining engineering and operations staff.
- AM1 specific testing on Release B resources directed by an AM1 test director and supported by LaRC sustaining engineering and operations staff.

The following subjects are described in the scenario:

- Selected roles and responsibilities of personnel involved in the scenarios.
- Annotated timeline for showing activities and personnel involved in those activities. Descriptive material on an ECS operator position by position basis is provided.
- Typical product generation activities assuming 16 hours a day, 7 days a week for product generation.
- Typical hard media distribution activities using different assumptions about amount of hard media to be distributed and the time required to distribute that media.

See Day in the Life 1a through 1tt on the following page.

5.2 Marshall Space Flight Center (MSFC)

This section describes the activities at the ECS portion of MSFC during the operation of ECS Release A.

5.2.1 MSFC Release A Missions

The following are the Release A missions for the MSFC DAAC.

- LIS data ingest, production, archive and distribution
- SSM/I data ingest, archive and distribution
- PR/TMI/GV data ingest, archive and distribution
- V0 data migration, archive and distribution
- LIS algorithm updates integration and test
- Transition to Release B baseline
- Above activities parallel to V0 operations

5.2.2 TRMM Missions (Release A) Key Interfaces: MFSC DAAC - ECS

See MSFC 1a on the following page.

5.2.2.1 TRMM: TSDIS to MSFC

The purpose of this interface is for ECS systems at the MSFC DAAC to ingest TMI and PR level 1A data, levels 1B through 3B of standard and combined (location of archived combined TMI/PR products is TBR by CDR) science data products derived from TMI and PR Instrument data via TSDIS processing and reprocessing, levels 1B to 3A ground validation (GV) data products derived from 10 ground radar sites, and associated browse products. ECS archives and distributes these data products as a service for TSDIS. ECS receives 24 hours of processed data products daily (except level 3 products, which are made available to ECS at 5-day and monthly intervals), and 2 days worth of reprocessed data products daily during reprocessing periods, from TSDIS. The total data volume ECS receives from TSDIS daily for archive is approximately 13.4 GB per day of processed, and 26.7 GB per day of reprocessed, TMI, PR and combined products. The data products are described in the TRMM Science Requirements Document, dated March 30, 1994. Table 4-4. TMI, PR, and GV Product Daily Volumes.

5.2.2.2 TRMM: MSFC to TSDIS

The purpose of this interface is for ECS systems at the MSFC DAAC to provide to TSDIS, through a Data Request, archived levels 1A through 3A of TMI, PR, and GV (except level 1A) standard processed and reprocessed science data products, for the purpose of TSDIS reprocessing. During reprocessing periods, ECS prepares 2 days worth of the requested archived processed or reprocessed data daily for TSDIS. The volume of data products provided daily to TSDIS for reprocessing is approximately 9.4 GB per day. The data products are described in the TRMM Science Requirements Document, dated March 30, 1994.

Ancillary Data

Special Sensor Microwave/Imager (SSM/I)

The MSFC DAAC provides to TSDIS, through a standing order, SSM/I Level 1B ancillary data for use in generating processed and reprocessed data products. ECS prepares 1 day of the requested ancillary data for processing, and 2 days for reprocessing, daily for TSDIS. The volume of SSM/I ancillary data provided daily to TSDIS is approximately 240 MB per day of data. The source of this data is MSFC (TBR before the CDR). ECS/MSFC will provide the SSM/I Level 1B ancillary data to TSDIS in HDF-ECS format.

Geostationary Operational Environmental Satellite (GOES) Precipitation Index (GPI) Ancillary Data

The MSFC DAAC provides to TSDIS, through a standing order, GPI ancillary data (product ID 3A-44, also called GPCP Satellite- Derived (Infrared) Monthly Rainfall) for use in generating data products. ECS prepares 1 day of the requested ancillary data for processing and 2 days for reprocessing, daily, for TSDIS. Data covering 30 days are updated at ECS monthly. The volume of GPI ancillary data provided to TSDIS is approximately 1000 MB per month. The source of this data is NESDIS (TBR). The GPI ancillary data will be provided to TSDIS in native format (TBR).

Global Precipitation Climatology Centre (GPCC) Ancillary Data

The MSFC DAAC provides to TSDIS, through a standing order, GPCC Monthly Gridded Rain gauge Data (product ID 3A-45) for use in generating data products. ECS prepares 1 day of the requested ancillary data for processing and 2 days for reprocessing, daily, for TSDIS. The volume of GPCC ancillary data provided daily to TSDIS is TBD MB (1.5 MB per year (TBR)). The source of this data is GPCC in Germany (TBR).

5.2.2.3 MSFC DAAC to ECS

System interfaces between ECS and the MSFC DAAC for ECS TRMM Release:

The MSFC DAAC is responsible for providing Special Sensor Microwave/Imager (SSM/I) ancillary data products to ECS. Some of the NOAA/NESDIS datasets acquired by the MSFC DAAC are used by ECS as ancillary data for ECS production (e.g., CERES). In addition, ECS supplies the TRMM Science Data Information System (TSDIS) with ancillary data, including the SSM/I data, for TSDIS production. The ancillary products to be delivered are agreed upon by ECS and the MSFC DAAC well in advance of the ECS need date.

The V0 System at the MSFC DAAC establishes, on a server, a directory which is dedicated to ECS; and sets up a subdirectory, within this directory, for each product required by ECS. Whenever a new granule of SSM/I ancillary data is staged on the server, and a link to the granule has been placed in the appropriate product subdirectory, the V0 System at the MSFC DAAC sends a Data Availability Notification (DAN) to ECS, informing ECS of the availability of the new granule. ECS then sends an SSM/I Ancillary Data Request to the V0 System, requesting a transfer of SSM/I ancillary data from the V0 System to the ECS. Finally, the SSM/I Ancillary Data electronically transfers a file from the V0 System to ECS, using either File Transfer Protocol (FTP) or Network File System (NFS).

5.2.3 Day in the Life of ECS at MSFC DAAC

The purpose of this day in the life scenario is to illustrate typical activities, their frequency of occurrence during the Release A time frame, and the types of coordination and actions required by members of the operations and engineering staff. The day described at the MSFC DAAC is Thursday, 26 Feb 98.

Planned for 26-Feb-98 at MSFC:

- Routine management and engineering activities.
- Routine operations.
- A TRMM/LIS SW maintenance test by the LIS SCF team.

The following subjects are described in the scenario:

- Typical product generation activities assuming 8 hours a day, 7 days a week for product generation.

- Typical hard media distribution activities using different assumptions about amount of hard media to be distributed.

See Day in the Life 2a through 2h following this page.

5.3 Goddard Space Flight Center (GSFC)

This section describes the activities at the ECS portion of GSFC DAAC during the operation of ECS Release A.

5.3.1 GSFC Release A Missions

The following are the Release A missions and operations activities for the GSFC DAAC.

- VIRS data ingest, archive and distribution
- MODIS algorithm integration and test
- AM-1 interface test support
- V0 data migration, archive and distribution
- Transition to Release B baseline
- Above activities parallel to V0 operations

5.3.2 TRMM Mission (Release A) Key Interfaces: GSFC DAAC - ECS

See GSFC 1a following this page.

5.3.2.1 TRMM: TSDIS to GSFC

The GSFC DAAC ingests levels 1A and 1B standard VIRS data products, VIRS combined products (archive location of these products is TBR before the CDR), and associated browse data derived from TSDIS processing and reprocessing. ECS archives and distributes these as a service for TSDIS. ECS receives 24 hours of processed data products daily (except level 3 products, which are every 5 days), and 2 days worth of reprocessed data products daily during reprocessing periods, from TSDIS. The total data volume ECS receives from TSDIS daily for archive is approximately 1.4 GB per day of processed, and 2.8 GB per day of reprocessed, VIRS products. The data products are described in the TRMM Science Requirements Document, dated March 30, 1994.

TRMM VIRS Metadata

The purpose of this interface is for ECS systems at the GSFC DAAC to ingest metadata for each standard product derived from VIRS data via TSDIS processing and reprocessing. In addition, ECS ingests updated metadata containing new QA flags as needed after product QA. ECS archives and distributes the metadata as a resource for TSDIS. Updated metadata are delivered in batches containing several products at a time. The metadata is included within each product file, and is delivered electronically with the products, with ECS initiating the file transfer, following the

TSDIS to ECS Data Transfer Protocol shown in Figure 4-2. The metadata are generally described in the Proposed ECS Core Metadata Standard, Release 2.0, document, dated December 1994. Detailed metadata formats are TBR before the CDR.

5.3.2.2 ECS/GSFC to TSDIS Interface

TRMM VIRS Archived Data for Reprocessing

The GSFC DAAC provides TSDIS, through a Data Request, archived levels 1A and 1B VIRS standard and combined processed and reprocessed science data products, for the purpose of TSDIS reprocessing. During reprocessing periods, ECS prepares 2 days worth of the requested archived processed or reprocessed data daily for TSDIS. The volume of data products provided daily to TSDIS for reprocessing is approximately 1.5 GB per day. The data products are described in the TRMM Science Requirements Document, dated March 30, 1994.

National Meteorological Center (NMC) Ancillary Data

The GSFC DAAC provides TSDIS, through a standing order, the Final Analysis and Forecast System, Global Analysis (FNL) NMC Gridded Data Product (TBR) for use in generating data products. ECS prepares 1 day of the requested ancillary data for processing and 2 days for reprocessing, daily, for TSDIS. The volume of FNL data provided daily to TSDIS is approximately 5 MB per day (TBR). The FNL product is received at ECS in NOAA's GRid In Binary (GRIB) format (TBR).

5.3.3 Day in the Life of ECS at GSFC DAAC

A Day in the Life scenario was not developed for GSFC since it is analogous to those described for LaRC and MSFC and less complicated since GSFC does not provide data production during Release A.

6. System Level Scenarios

ECS must support a wide range of data and algorithm sources and, once ingested into the system, support production and archiving of valuable data products for subsequent retrieval by Earth Science researchers and eventually a wider user community. ECS must also support users in finding and accessing relevant data collections and services of interest to them via information discovery and management services. ECS has a goal of supporting and indeed facilitating collaborative, interdisciplinary research. System level scenarios provide specific examples of how individual ECS activities discussed above in Section 4 combine to provide the infrastructure needed for ongoing system-wide operations (system management); ingest, production and archiving ("push"); and information discovery and retrieval ("pull").

System Management Scenarios (Section 6.1) show examples of cross-DAAC coordination for a software upgrade, and cross-DAAC resource management. Push Scenarios (Section 6.2) show examples of MODIS planning and processing, and cross-DAAC production coordination for products dependent on MODIS input (CERES, MISR, and higher-level MODIS products). Pull Scenarios (Section 6.3) show examples of an interdisciplinary investigator accessing, browsing and retrieving a wide range of data contained within EOSDIS, and a research scientist who is developing a technique which will integrate data from sensors of varying spatial, temporal, and spectral resolutions (ASTER, MODIS, and Landsat 7).

The push recovery scenario shows an example of recovery from a hypothetical situation where an error in a processing algorithm corrupts products across several DAACs over a period of a week. The pull recovery scenario shows an example of recovery from a large surge in demand for EOS products due to an unusual geophysical event.

6.1 System Management Scenarios

The DAACs, EOC and SMC utilize ECS infrastructure services to work together to identify, monitor, and resolve system-wide activities. The added value of Release B will be highlighted in each scenario.

6.1.1 Cross-DAAC Software Upgrade Coordination

The scenario depicts the process of scheduling a software upgrade across DAACs. The scenario addresses the evaluation of upgrade requirements, coordination of the upgrade with the DAACs, and resolution of scheduling conflicts as they arise. The scenario also traces the coordination of the upgrade request, confirmation, and adjudication that leads to the development of a coordinated master schedule by the SMC.

Additionally the scenario includes the process for acquiring, storing and maintaining schedule related policies, negotiating and maintaining ground event functional allocations and assessing priorities. Finally the scenario addresses procedures for adjudicating cross-site and cross-facility schedule conflicts that ensure the most efficient use of individual DAAC and system components.

See SYSTEM MGMT 1a through 1g.

6.1.2 Cross-DAAC System Resource Management

This scenario depicts resource management tasks related to configuration, maintenance, inventory, logistics, and training at the SMC, EOC and LSM's. The scenario describes interaction of SMC and LSM configuration management functions, coordination and movement of resources between ECS sites, and management of COTS software licenses and ECS-provided toolkits.

Further, the scenario describes the interactions between the SMC and LSM's required for on-site and off-site corrective and preventive systems hardware maintenance, as well as monitoring off-site repair activities. SMC/LSM logistics management activities are depicted as SMC/LSM monitor and communicate information concerning spares and consumable inventories and replenishment.

See SYSTEM MGMT 2a through 2j.

6.2 Push Scenarios

From a data perspective Release A contains a diverse set of data types and representations, a large data volume (TB/day and PB archives), complex data product interdependencies, and a requirement for long-term archival of critical Earth science data products.

6.2.1 Nominal Science Data Production, Missing Ancillary Data, and "Reprocessing" Request Scenarios

The standard products generated from the CERES and LIS instruments on the TRMM mission will only begin after a several week period of spacecraft and instrument checkout following launch. Even then, calibration and other algorithm tuning will be needed before reliable products are available.

Standard product generation in ECS Release A will nominally begin in October 1997 and increase over the following 5 months.

The first Data Push scenario describes nominal Science Data Production, which is highly automated. The second scenario describes a situation where one ancillary data file is missing, cancellation of data processing requests (DPRs), and replanning when the data file becomes available. The third scenario involves a request for processing specific input data again, but using a different science algorithm mode (i.e., "reprocessing").

In these scenarios, it is assumed that:

- A Plan has been activated.
- A subscription has been registered with the data server for QA evaluation of the output products by an Instrument Team Investigator.
- QA is done at SCF, with update of the quality assessment metadata field(s) done by the Investigator..

Fault handling is not a part of these scenarios, since faults of individual subsystems are addressed elsewhere in specific subsystem and fault management scenarios.

See DATA PUSH 1a through 1j.

6.3 Pull Scenarios

ECS as a system must support a diverse set of users (disciplines, expertise, objectives, methods, tools) who are geographically distributed and use widely varying computational and networking capabilities. An inherent part of the scientific research method is that increased understanding leads to changes in the way scientists conduct Earth science research. ECS must support the reality that the scientists' interactions will change many times over the life of the system.

6.3.1 Data Order Using ECS Client Scenario

The science data user will access the ECS via a client. The Desktop of the ECS Release A Client provides a general framework for organizing and presenting application objects which the user employs to invoke the ECS services. Residing on the Desktop are application tool objects (i.e., the Workbench) which provide the capability to Browse, search and order via the V0 Client. In addition, the Workbench provides access to advertisements of data and services, and data visualization via EOSView.

The operational lifetime of ECS Release A will be approximately 12 calendar months, beginning nominally April 1997 and ending with transition of TRMM operations to ECS release B in March 1998. The data that will be initially available from ECS will consist of V0 data which has been migrated to ECS and unmigrated V0 data.

Migration of data from V0 to V1 begins with initial operations of Release A, but will continue through end of operations of Release B. Until the Data Readiness Review for each migrated data product, that data product will continue to be available only from the V0 system. V0 data will always be available to the science community through two way interoperability between ECS and V0, i.e., transition of the operational responsibility from V0 to ECS will be transparent to the user community.

The standard products generated from the CERES and LIS instruments on the TRMM mission will only begin after a several week period of spacecraft and instrument checkout following launch. Even then, calibration and other algorithm tuning will be needed before reliable products are available. For example, the earliest that full CERES standard product generation will likely occur is January 1998.

Data products produced by the TRMM Science and Data Information System (TSDIS) are to be archived in ECS, but initially available only to authorized TRMM science users during a six month blackout period. The availability of ancillary data such as NMC and NOAA/NESDIS fields to general science data users is yet to be determined. The NMC Analysis fields and NOAA/NESDIS Snow/Ice Cover maps will be available in HDF format

Similarly, NOAA/NESDIS Aerosol and Vegetation Index Data will be available to TRMM Science Users beginning with TRMM Launch, and possible with the beginning of Release A Operations. These will only be available in their native formats

The above implies that 1) unmigrated V0 data can be searched and ordered via ECS Client, but no value is added, and 2) ECS services (e.g., browse, subsetting) are not available with the Release A Client, even for migrated V0 data. In addition, validation of CERES and LIS algorithms and data may not be completed during the operational life of Release A. Data visualization of NMC Analysis Fields will be possible, however, using EOSView.

The User Pull scenario involves a hypothetical investigation employing search, browse and order of V0 and V1 data. The Hypothetical Investigator (HI) is trying to determine:

- The locations of any genesis regions for severe thunderstorms in the Andes of Bolivia, Peru and Northern Chile.
- The extent to which these genesis regions differ during El Niño years.
- The relative intensities of severe thunderstorms produced by these genesis regions, as measured by their lightning activity.

This Data Pull scenario is a modification of DID 305, Scenario 2 . It involves Search and Order of data from 2 DAACs. Some data ordered is to be transferred via network, with the remaining ordered data to be supplied via media.

Scenario assumptions are:

- The user is already registered.
- The employs the ECS Client.

See DATA PULL 1a through 1i.

Abbreviations and Acronyms

ACRIM	Active Cavity Radiometer Irradiance Monitor
ADC	Affiliated Data Center
ADEOS	Advanced Earth Observing Satellite (Japan)
ALT	Altimeter
AM	Morning (ante meridian) -- see EOS AM
AMSU	Advanced Microwave Sounding Unit
ASF	Alaska SAR Facility
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer (formerly ITIR)
ATC	Absolute Time Command
AVHRR	Advanced Very High-Frequency Radiometer
C&DH	Command and Data Handling
CCB	Configuration Control Board
CCR	Configuration Change Request
CCSDS	Consultative Committee for Space Data Systems
CDR	Critical design review
CERES	Clouds and Earth's Radiant Energy System
CIESIN	Consortium for International Earth Science Information Network
CII	Chemistry International Experiment
CLCW	Control Link Command Words
CLS	Client Subsystem
CNES	Centre National d'Etudes Spatiales (France)
COLOR	Ocean Color - see EOS COLOR
CSA	Canadian Space Agency
CSMS	Communications and System Management Segment
DAAC	Distributed Active Archive Center
DAR	Data Acquisition Request
DCN	Document Change Notice
DID	Data item description; data ingest/distribution

DOD	Department of Defense
DOE	Department of Energy
DORIS	Doppler Orbitography and Radiopositioning Integrated by Satellite
DPS	Data Processing Subsystem
DPS	Data Processing Subsystem
DSS	Data Server Subsystem
Ecom	EOS Communications
ECS	EOSDIS Core System
EDC	EROS Data Center
EDHS	ECS Data Handling System
EDOS	EOS Data and Operations System
EMC	Enterprise Monitoring and Coordination
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
EOSSMS	EOS Space Measurement System
EOSSRP	EOS Scientific Research Program
ERS	Earth Resources Satellite
ESA	European Space Agency
ESDIS	Earth Science Data and Information System (Project)
ESN	EOSDIS Science Network
ETM	Enhanced Thermatic Mapper
FDF	Flight Dynamics Facility
FOO	Flight of Opportunity
FOS	Flight Operations Segment (ECS)
FOT	Flight Operations Team
GAC	Global Area Coverage
GLAS	Geoscience Laser Altimeter System
GN	Ground Network
GSFC	Goddard Space Flight Center
HIRDLS	High-Resolution Dynamics Limb Sounder

ICC	Instrument Control Center
ICD	Interface Control Drawing
IDR	Incremental Design Review
IEOS	International Earth Observing System
INS	Ingest Subsystem
IOS	Interoperability Subsystem
IP	International Partners
IR	Infrared
IST	Instrument Support Terminal
IWG	Investigator Working Group
JERS	Japanese Earth Remote-Sensing Satellite
JPL	Jet Propulsion Laboratory
LAN	Local Area Network
LaRC	Langley Research Center
LIS	Lightning Imaging Sensor
LSM	Local System Manager
LTIP	Long Term Instrument Plan
M&O	Maintenance and Operations
MHS	Microwave Radiometer (NOAA)
MIMR	Multifrequency Imaging Microwave Spectrometer
MISR	Multi-Angle Imaging SpectroRadiometer
MITI	Ministry of International Trade and Industry (Japan)
MLS	Microwave Limb Sounder
MODIS	Moderate Resolution Imaging Spectrometer
MOPITT	Measurements of Pollution in the Troposphere
MR	Microwave Radiometer
MSFC	Marshall Space Flight Center
MSS	Management Subsystem
MTPE	Mission to Planet Earth
Nascom	NASA Communications Network
NASDA	National Space Development Agency (Japan)

NCAR	National Center for Atmospheric Research
NCC	Network Control Center
NESDIS	National Environmental Satellite, Data, and Information Service (NOAA)
NOAA	National Oceanic and Atmospheric Administration
NOC	Network Operations Center
NOLAN	Nascomm Operational Local Area Network
NSCAT	NASA Scatterometer
NSI	NASA Science Internet
NSIDC	National Snow and Ice Data Center
OCD	Operations Concept Document
ORNL	Oak Ridge National Laboratory
PACOR	Packet Processor
PB	Petabyte (10^{15})
PDB	Project Data Base
PDR	Preliminary Design Review
PI	Principal Investigator
PI/TL	Principal Investigator/Team Leader
PLS	Planning Subsystem
PSCN	Program Support Communications Network
RF	Radio Frequency
RFSOC	Radio Frequency Simulation Operations Center
RIR	Release Initiation Review
RTS	Relative Time Sequence
SAR	Synthetic Aperture Radar
SCF	Science Computing Facility
SDPF	Science Data Processing Facility
SDPS	Science Data Processing Segment
SDR	System Design Review
SDS	System Design Specification
SDVF	Software Development and Validation Facility
SEDAC	Socio-Economic Data and Application Center

SMC	System Monitoring and Coordination Center
SMMR	Scanning Multichannel Microwave Radiometer
SN	Space Network
SNC	Space Network Control
SOC	Simulation Operations Center
SRR	System Requirements Review (ECS)
SSALT	Solid State Radar Altimeter
SSM/I	Special Sensor Microwave/Imager
TB	Terabyte (10^{12})
TBD	To Be Determined
TBS	To Be Supplied
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TES	Troposphere Emission Spectrometer
TIROS	Television and Infrared Observation Satellite
TL	Team Leader
TM	Team Member
TMI	TRMM Microwave Imager
TOPEX	Ocean Topography Experiment
TOVS	TIROS Operational Vertical Sounder
TRMM	Tropical Rainfall Measuring Mission (joint US-Japan)
TSDIS	TRMM Science Data and Information System
UARS	Upper Atmosphere Research Satellite
USGS	U.S. Geological Survey
UWG	User Working Group
VAP	Value Added Provided
VIRS	Visible Infrared Scanner
V0	Version 0
WOTS	Wallops Orbital Tracking Station
WSC	White Sands Complex